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Building Directorate

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Our ref: QTD 20/1

4 October 1993

Dear Sir or Madam

PROPOSED AMENDMENTS TO REGULATIONS 22, 23 AND THE INTERPRETATIVE REGULATIONS OF THE BUILDING STANDARDS (SCOTLAND) REGULATIONS AND PARTS J, K AND A OF THE SUPPORTING TECHNICAL STANDARDS

INTRODUCTION

1. The purpose of this consultation letter is to seek comments on detailed proposals which have been developed for amendments to the Building Standards requirements for conservation of fuel and power (Part J) and ventilation (Part K) in buildings. The opportunity is also being taken to propose amendments to Part A (General). Subject to the comments received, the aim is to lay before Parliament revisions to these Parts early in 1994 and, after the industry has had time to assimilate the changes, to bring them into force later that year.

2. In the White Paper 'This Common Inheritance: Britain's Environmental Strategy (1990)' the Government gave a commitment to look carefully at the scope for improvement in the Building Regulations for the conservation of fuel and power and to reduce CO$_2$ emissions. The first year report on the White Paper (1991) announced the intention to proceed with a further revision of the Building Regulations in 1993/94 to promote energy efficiency. This was endorsed both in the Manifesto and in the second year report (1992).

PART J

3. The Building Standards Regulations have always included requirements for thermal insulation but it is only since 1974, when additional powers were added to the Building (Scotland) Act 1959, that they have been aimed specifically at energy conservation. Successive revisions to the Regulations have added further measures and improved standards. Because of growing environmental concerns and the Government's commitment to reduce CO$_2$ emissions, the present proposed revision is being undertaken in a significantly shorter timescale than previous revisions.

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4. The aim of the review is to reduce CO_2 emissions by incorporating cost effective measures, but to do so in a way which does not introduce unnecessary technical risks and to maintain some flexibility for designers in how the requirements can be met. When considering cost effective measures, in order to address environmental issues, account has been taken not only of current fuel costs, but of the implications of higher fuel prices in the longer term.

5. As the standards of insulation for new buildings have improved over the years, heat loss from air leakage through the less well insulated parts of the building fabric (such as windows, doors, cold bridges around such openings, mortar joints and timber members) has become relatively more important. In new non-domestic buildings the energy used in lighting, air conditioning and mechanical ventilation has assumed greater significance. Proposals are included for dealing with these matters in the Technical Standards. The proposals also consider the incorporation of a Home Energy Rating requirement into the Regulations. Views are invited on the merits of these proposals and on the practicality of their implementation.

PART K

6. The Building Standards Regulations have always included requirements for ventilation but the purpose of this revision is to take into account further research information and to simplify provisions where appropriate.

7. The revisions therefore attempt to provide greater potential for limiting condensation whilst trying to ensure that potentially lethal combinations of extract fan and certain heating appliances do not occur. In addition they have been simplified by considering ventilation of dwellings on a 'whole house' basis and removing the existing constraints on ventilation openings into courtyards.

8. It is also proposed to require evidence of commissioning and testing of mechanical or air conditioning systems in buildings. Views are invited on the merits of this proposal and on the practicality of its implementation.

PART A

9. This Part has been the subject of a comprehensive overhaul in the light of comments received from users and the move towards harmonised building standards within the UK. Additional standards have been included to take account of evolution in building control practice and to clarify certain aspects of the standards published in 1990. Some necessary adjustments are also proposed to definitions which have a bearing on Parts D and E which as a separate exercise is currently under revision.

SUMMARY

10. The draft revisions of Parts J, K and A with a covering note summarising the main changes in each case are enclosed (Appendices 1, 2 and 4). A copy of the draft BRE Guide on mechanical ventilation and air conditioning is also attached (Appendix 3). It should be noted that BRE also intend to update their guidance document on reducing technical risks which is referred to in the Technical Standards and their Information Paper IP 18/88 referred to in the deemed-to-satisfy for Part K.

COST

11. In considering proposals for new regulations, the Government places great importance on giving due weight to business' perception of the proposal's likely impact on business. To measure this impact, a Compliance Cost Assessment (CCA) is produced for all such proposals, and made available to business on request. Cost comments are therefore included for Parts J and K in Appendices 1 and 2 and, in giving your views on the proposals described in this document, it would be particularly helpful if you could identify and quantify any additional direct or indirect costs (recurring and non-recurring) that would be likely to arise for your (sector of) business as a result.

CONSULTATION WITH BSAC AND SUBMISSION OF COMMENTS

12. The Secretary of State is required before making or amending the Building Standards Regulations to consult the Building Standards Advisory Committee (BSAC) and such other bodies as appear to him to be representative of the interests concerned. BSAC have already been consulted and you are now invited to submit any comments you may wish to make on any or all of these proposed amendments to:

Ms L Orr
Building Control Division
The Scottish Office Building Directorate
Room 3/115
New St Andrew's House
EDINBURGH
EH1 3TG

(Telephone number: 031-244 4168)

by 6 December 1993.

13. In order to assist with the collation of replies, respondents are asked to use a separate sheet of paper for comments on each Part.

14. The Scottish Office intends to follow its normal practice of making copies of the responses received available to the public on request. We will therefore assume that responses can be made available in this way unless respondents indicate that they wish all, or part, of their reply excluded from this arrangement.

15. A list of external bodies to which this letter is being sent is attached at Appendix 5.

Yours faithfully

GEORGE GRAY

APPENDIX 1

BUILDING REGULATIONS PROPOSED REVISION OF PART J

CONSERVATION OF FUEL AND POWER

BUILDING REGULATIONS PROPOSED REVISION OF PART J
CONSERVATION OF FUEL AND POWER
OUTLINE OF THE PROPOSALS

1. The following paper outlines the main changes proposed to Regulation 22 and Part J of the Technical Standards.

PROVISIONS FOR DWELLINGS AND NON-DOMESTIC BUILDINGS

Glazing

2. The current provisions are based on the use of single glazing and standards are not generally included for doors. It is proposed to include provision for both doors and windows (based on the U-value for a double-glazed metal framed window with a thermal-break). The proposed areas of openings now include both windows and doors, but the maxima set should not generally produce a significant difference from the current provision based on window areas alone. Designers at present have been able to exceed this area by the use of double-glazing. In order to maintain flexibility designers who wish to increase window areas will be able to do so but they will now need to make compensating provisions such as windows with an improved U-value, or coated or argon filled glazing.

Fabric insulation

3. Although not evident from the stated U-values, existing standards of fabric insulation have been improved as follows:

(i) By changing the way U-values are calculated in order to take account of cold bridges such as mortar joints, timber joists and studs, at present these can be ignored.

A way of satisfying this provision could be to:

(a) increase loft insulation in a timber roof,

(b) add an insulated dry lining to an aerated concrete block wall, or additional insulation to a timber framed wall, and

(c) increase the insulation of a timber ground floor.

(ii) As double-glazing is now included in the provisions the existing simple trade-off between double-glazing and lower standards of wall, floor and roof insulation will no longer be generally available.

4.(i) The U-value of roofs in residential and institutional buildings (purpose groups 1 and 2A) is improved from 0.45 (calculated to the new procedure) to 0.35 or 0.25 in the case of a roof with a loft space.

(ii) Views are also invited on the possible option of upgrading the standards for roof insulation in dwellings from U-value 0.25 (calculated to the new procedure) to U-value 0.2 and for upgrading the floor from U-value 0.45 (calculated to the new procedure) to U-value 0.35. Such levels could perhaps be cost effective on the highest fuel price assumptions, but they have not been included in the main proposals as additional savings are comparatively small. If they were to be adopted, consideration would have to be given to any possible technical risks such as the difficulty of providing adequate roof ventilation and the scope for flexibility in design would be further reduced.

(iii) Because of evidence about technical risks such as rain penetration and the need to maintain the option of an economical clear cavity construction it is not proposed that the U-value for walls should be improved further than proposed in paragraph 4.

5. The means of demonstrating appropriate provisions for the building fabric have been revised by the introduction of a "Target U-value approach". This target which replaces the present "calculated trade offs" is derived from the shape and size of the building proposed. As previously an "Elemental approach" is also included and the existing calculation procedures based on BREDEM for dwellings and the CIBSE energy code for non-domestic buildings are retained.

(i) When demonstrating if a particular building achieves the "U-value target" the designer can, if he so chooses, take the benefit of solar gains into account.

(ii) The benefit of efficient heating can also be taken into account provided that an adjustment is made to compensate for the shorter life of the heating system compared with that of the building fabric itself. For example it is suggested that the "U-value target" could be increased by 5% where a condensing boiler is installed. This could encourage the use of more efficient heating systems and help to retain some flexibility for building designers.

Air Leakage

6. In order to reduce heat loss through air leakage, provisions are included for the first time for draught stripping of doors and windows and for the sealing of gaps in the building fabric such as around window frames, linings, skirtings, loft hatches and switch and socket outlets.

Heating and Hot Water

7. Improved controls are proposed on domestic heating systems so that bedrooms etc can be controlled at a lower temperature than living rooms and the insulation of hot water cylinders and their controls are improved.

ADDITIONAL PROVISIONS FOR NON-DOMESTIC BUILDINGS

Air conditioning/Mechanical ventilation

8. Air conditioned and mechanically ventilated buildings generally use significantly more energy than naturally ventilated buildings. Views are invited regarding the desirability of addressing these matters in the Building Regulations. It is proposed that mechanical ventilation and air-conditioning systems serving more than 500m^2 of floor area should only be used where natural ventilation is inappropriate. Appropriate systems should be selected, they should be controlled effectively and evidence that they have been adequately commissioned should be provided to the Building Control Officer. Guidance is provided in a separate BRE publication; a draft is attached to the end of Part J for comment.

Lighting

9. For the first time, a requirement is proposed for the introduction of efficient lighting with adequate controls. Guidance on the selection of appropriate lighting and switching is included with an alternative approach which can be adopted where different fittings are selected or to compensate for lower levels of natural lighting.

CONSERVATORIES

10. Where a conservatory is to be built as part of a new dwelling and it is open to the accommodation it should be treated as part of the dwelling for the purpose of establishing the appropriate fabric insulation.

HOME ENERGY RATINGS

11. In addition to the above it is proposed that dwellings should be provided with an energy rating (on a scale of 1-100) indicative of the energy cost of running the dwelling, using the Government standard assessment procedure (SAP) and provided by an independent organisation authorised by Government to issue SAP ratings. This should encourage the use of more efficient fuels, heating appliances and dwelling types in addition to improving the insulation of the building fabric and controls beyond the Building Regulations provisions. It would also enable the purchaser or householder to compare the energy efficiency of different dwellings. The Energy Efficiency Office estimate that the cost of obtaining a SAP rating is in the order of £30 per dwelling.

12. We have considered the possibility of setting a SAP rating as the way of demonstrating compliance with the Building Regulations themselves. Because of the significance of fuel costs in the SAP rating compared with the significance of the building features covered by the Regulations, it is not considered that such an approach would be practical.

13. Views are however invited on the desirability of requiring all dwellings with a SAP rating of 60 or less to have higher standards of fabric insulation. This requirement is debatable because in order to establish the appropriate U-values or "U-value target" to be achieved a

designer would need to establish if the ultimate SAP rating was likely to be 60 or less. In order to establish this the fuel type, heating system and orientation of the dwelling would need to be known as well as the details of the design itself. In addition, the SAP rating can change on an annual basis in line with three year rolling average fuel price, which could bring a dwelling below the threshold when previously it was not.

ESTIMATED COSTS AND SAVINGS

14. BRE estimate that the proposals would be cost effective. They would increase the construction costs of an average house by around 1% to 2% depending on the type of construction and improve the energy performance of space and water heating by around 25% to 35% when compared with current Building Regulation standards. Similar costs and improvements are estimated for non-domestic buildings.

15. The contribution made by the various measures is dependent on the type of construction. It is estimated that in a semi-detached house improvements would be as follows:-

(i)	Reduced fabric heat loss due to thermal bridges such as mortar joints, timber joists/studs and improved insulation around openings.	3% - 11%
(ii)	Double-glazing or improved fabric insulation where double-glazing is at present used as an alternative provision.	13%
(iii)	Draught stripping of doors and windows and sealing gaps in the building fabric.	6%
(iv)	Improved heating/hot water controls and cylinder/pipe insulation	3% - 5%
	TOTAL	25% - 35%

BUILDING REGULATIONS PROPOSED REVISION OF PART J

CONSERVATION OF FUEL AND POWER

COST COMMENT

1. The proposal is to revise the existing requirements of the Building Regulations for the conservation of fuel and power (Part J). The requirements of the Building Regulations apply when building work is undertaken. Provisions for the conservation of fuel and power at present include the insulation of the building fabric, insulation of the hot water storage system and controls on the heating and hot water system.

Proposed changes

2. The main changes to the requirements include:

   a. improved fabric insulation/including double glazing;

   b. reduced air leakage;

   c. improved heating/hot water controls and cylinder/pipe insulation;

   d. in non-domestic buildings the appropriate use and efficiency of air conditioning/mechanical ventilation;

   e. in non-domestic buildings energy efficient lighting;

   f. the introduction of "Home Energy Rating".

Purpose of the Regulations

3. Buildings account for almost half of the UK energy consumption and a similar proportion of energy-related CO_2 emissions. The proposals arise out of the Government's aim to reduce the CO_2 emissions by the year 2000, to 1990 levels, and the longer term aim of maintaining CO_2 emissions at a reasonable level. The Government's White Paper, "This Common Inheritance", included commitments to examine the scope for further improvements to the Building Regulation requirements, and the incorporation of energy labelling into the Building Regulations. The Government's 1990 manifesto included a commitment to consult on new Building Regulations to improve energy use.

Business Sectors Affected

4. The proposed changes to existing Regulations will affect developers, builders, sub-contractors, building product manufacturers, building professionals and those commissioning new building work. The cost of building control fees would, at current rates, be under 1% of the cost of the work. The building industry and those concerned with building control will have to acquaint themselves with the new provisions and appropriate revisions will be required to standard type plans and construction details. In addition the Energy Efficiency Office estimate that the cost of obtaining an energy rating based on the Government's Standard Assessment Procedure is around £30 per dwelling.

5. The Building Research Establishment has estimated the additional building costs resulting from the improved standards as follows:

a. For an average new semi-detached house it is estimated that the cost of the measures would be in the order of £400-£650 depending on the type of construction, increasing the cost of construction by perhaps 1-2%. This will improve the energy performance for space and water heating by around 25-30% compared to current Building Regulation standards. If the possible additional higher standards for roof and floor insulation were included these could for an average dwelling produce additional improvements of up to 5%.

6. Calculations have been carried out on the cost and effectiveness of the proposals for non-domestic buildings. It is estimated that the proposed measures could increase building costs by £5 to £10 per square metre depending on the type of construction, and as for dwellings this could increase the cost of the average non-domestic building by perhaps 1-2%.

7. The proposals for both dwellings and non-domestic buildings are considered to be cost effective (the assumptions for the cost effectiveness calculations are shown in Annex A to this paper). Overall measures could be expected to pay for themselves in 8 to 15 years depending on the building design. The possible additional higher standards for insulation of roofs and floors in dwellings could be cost effective at the highest fuel price assumptions.

8. After making some allowance for higher levels of comfort which may result from the improved energy performance of the buildings, it is estimated that at the current rate of construction by the year 2000 these measures could save perhaps 7.5 petajoules per year in comparison with what would otherwise occur. This would result in estimated annual CO_2 saving in the order of half a million tonnes.

Effects on International Competitiveness

9. The proposal will encourage UK companies to develop further energy efficiency measures, which could be beneficial in developing overseas markets for energy efficiency products. The proposals should not place UK companies at a competitive disadvantage.

Arrangements for Monitoring and Review

10. The compliance cost assessment will be reviewed in the light of the consultation. Costs and benefits are kept under review by the Building Research Establishment.

Alternative Approaches

11. In present circumstances there does not appear to be an effective alternative to regulation. Because of the lack of public perception of the relative merits of various energy conservation measures, and available evidence that many developers would not make provision unless required to do so, a regulatory requirement appears to be necessary. Energy conservation is a somewhat complex matter, and consumers are generally unable to reach effective decisions about the energy efficiency of a particular new building. The tendency would therefore be for the matter

to go by default. It is significantly cheaper to take the necessary measures during the initial building operation than by way of improvement subsequently. The introduction of a home energy rating system into the Building Regulations should help to improve public perception of the relative performance of the energy efficiency of dwellings and could, if effective, reduce the need for regulation in the longer term.

BUILDING REGULATIONS: PROPOSED REVISION OF PART J

ASSUMPTIONS FOR COST EFFECTIVENESS CALCULATIONS

1. For the purpose of calculating the cost effectiveness of energy conservation a number of assumptions have been made. Unless otherwise stated these assumptions apply to domestic and non-domestic buildings.

2. NET PRESENT VALUE/CAPITAL COST

NPV/K is the sum of the discounted savings over the life of the measure less the initial capital cost, divided by the initial capital cost. If NPV/K is positive then net savings exceed net costs and the measure is cost effective.

3. COSTS

Costs are based on a tender price index and have been adjusted to 4Q, 1992.

4. SAVINGS

a. Domestic

Savings were calculated using a BREDEM-based model. External temperatures are based on a dwelling in the East Pennines (average for the UK). The heating levels in the dwelling are assumed to be 21°C in the living area and 18°C in the rest of the house. Two heating periods of 2 hours morning and 7 hours evening are assumed, with 16 hours continuous heating at weekends.

b. Non-domestic

Savings for non-domestic buildings were calculated using the CIBSE 2A method[1]. A UK average external temperature of 7°C was used. The heating pattern is dependent on building type, eg

Office	5 day week, 9 am - 5 pm
Hospital/hotel	full heating
Factory	6 day week, 12 hours.

5. DISCOUNT RATE

A Test Discount Rate of 6% has been used.

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[1] The CIBSE Building Energy Code 1981, Part 2: Calculation of Energy Demands and Targets for the Design of the New Buildings and Services; Section A: Heated and Naturally Ventilated Buildings.

6. LIFETIME OF MEASURES

The lifetime of the measures is taken to be:

a.	walls, roofs, floors	60 years
b.	glazing	20 years
c.	heating, controls and draughtstrip	15 years.

7. FUEL PRICES

Two fuel price assumptions have been used:

a. current fuel prices are adjusted to take account of the fuel mix: 90% primary fuel: 10% electricity.

b. the fuel price rise scenario uses assumptions consistent with the high price assumptions in Energy Paper 59[2], and for the purpose of assessing energy conservation measures a postulated carbon tax[3] has also been added.

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[2] Energy related carbon emissions in possible future scenarios for the UK. Energy Paper 59, HMSO 1992.

[3] The following illustrative carbon tax has been assumed for the purpose of assessing energy conservation measures: 1993 (gas, electricity +5%) rising to 2000 (gas +20%, electricity +15%).

TABLE 1 OPTIONS FOR DWELLINGS: NEWBUILD SEMI-DETACHED COSTS AND SAVINGS, 7 December 1992

PROVISION	1990 REGS 'U' values	(a)* PROPOSED 'U' values	ADDITIONAL COSTS	ANNUAL SAVINGS	(b)* POSSIBLE 'U' values	ADDITIONAL COSTS	ANNUAL SAVINGS	COMMENTS	PAYBACK	NPV/K SCENARIOS		
			£	GJ		£	GJ		yrs	(A)	(B)	(C)
1. ROOF	0.25 (150mm quilt)	0.25 new calculation (100 + 50mm quilt over joists)	8	0.4	0.2 (100mm + 100mm quilt over joists)	75	0.6	Address possible technical risks with (b)	(a) 3.9 (b) 25.1	3.13 -0.36	3.45 -0.31	4.19 -0.19
2. WALL	0.45	0.45 new calculation			0.35			Address possible technical risks if economic clear cavity solution cannot be retained	(a) - (b) 25.1	- -0.36	- -0.31	- -0.19
	(brick/75mm cavity fill/block)	(cavity fill as 1990)	nil	nil	(brick/100mm cavity fill/block)	226	2.2		(a) 21.4 (b) 23.8	-0.24 -0.32	-0.19 -0.27	-0.05 -0.15
	(timber frame 75mm insulation)	(timber frame, 100mm insulation)	128	1.3	(timber frame 125mm insulation)	214	2.2	Existing (0.6) with double glazing no longer available with (a) or (b)	(a) 15.7	0.03	0.11	0.3
	(brick/clear cavity/serrated block/25mm lining)	(thicker serrated block/reduced joints)	78	1.0	(brick/clear cavity/serrated block/50mm lining)	243	2.2		(b) 27.0	-0.4	-0.36	-0.25
3. FLOOR	0.45 (25mm insulation)	0.45 (as 1990)	-	-	0.35 (50mm insulation)	192	1.5	Just cost effective with Scenarios B and C	(a) - (b) 27.5	- -0.41	- -0.37	- -0.25
4. DOUBLE GLAZING (20% maximum)	Double glaze windows	Standard double glazed units or; better quality units	146 228	5.6	as (a)	146 229	5.6	Allows for larger glazing area without need for trade-off (risks as above)	(a) 5.8 (b) 9.1	0.67 0.25	0.76 0.33	0.89 0.49
5. DRAUGHT PROOFING	-	Draught proofing doors and windows	78	2.7	as (b)	78	2.7	Address possible technical risks. Positive provision for background ventilation required	6.5	0.5	0.58	0.71

PROVISION	1990 REGS 'U' values	(a)* PROPOSED 'U' values	ADDITIONAL COSTS £	ANNUAL SAVINGS GJ	(b)* POSSIBLE 'U' values	ADDITIONAL COSTS £	ANNUAL SAVINGS GJ	COMMENTS	PAYBACK yrs	NPV/K SCENARIOS (A)	(B)	(C)
6. HEATING CONTROLS	Single room thermostat	Separate upstairs/ downstairs control or; TRVs	64 56	1.5 2.0	as (a)	64 56	1.5 2.0	Some question about effective life	9.1 6.2	0.07 0.56	0.13 0.65	0.21 0.78
7. CYLINDER PIPE INSULATION	3.3 kWh/day heat loss	Improve standard to 2.4kWh/day heat loss	10	1.0	Improve standard as (a)	10	1.0	More space required in particular with CFC-free insulation	2.5	3.1	2.92	3.42
8. HOT WATER CONTROLS	Required on systems greater than 150 litres	Required on all systems	83	2.1	as (a)	83	2.1		9.2	0.06	0.12	0.21
TOTAL			389 to 641	13.3 to 15.1		862 to 1094	17.2 to 17.7					

Alternatives:

(i) the introduction of a condensing boiler might save 11 GJ and could be offered as an alternative to permit 'U' values of 0.35 roof, 0.6 wall and floor (all calculated to new method)

* Column (a) contains proposed measures based on "normal" fuel price assumptions. Column (b) contains possible measures based on "high" fuel price assumptions.

Scenario A - "Normal" ie 6% Test Discount Rate
Scenario B - Fuel prices based on the high scenario of EP93 Cost Projection for Central GDP
Scenario C - An "extreme" scenario combining the high fuel prices of Scenario B with the proposed EC carbon/energy tax proposals

PART J

CONSERVATION OF FUEL AND POWER

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PART J

INTRODUCTION

1. The intention of this Part is to ensure that effective measures are incorporated in a *building* for the conservation of fuel and power. It is emphasised that the following improved standards are minimum requirements and that it is in everyone's interest that higher standards are achieved wherever possible.

2. As in the previous Part J the standards for the *building* fabric require the provision of measures to limit heat losses and, where appropriate, maximise heat gains through the enclosing fabric of the *building*. The standards can be met in 3 different ways as follows -

   a. Elemental Approach. Under this method every part of the specified fabric elements of a *building* must be *constructed* to meet the prescribed *U-values* and the areas of windows, rooflights and doors must not exceed prescribed limits. NB - as part of this revision the calculation of *U-values* has been amended to ensure a higher standard of performance (see Appendix 1).

   b. Building Fabric Target Approach. This method supersedes the Calculated Trade Off method in the previous regulations and is derived from the shape and size of the proposed *building*.

   c. Energy Use Approach. This is a modified version of the Energy Target method and allows account to be taken of useful heat gains which may include, for example, solar gains, gains from a heat recovery system and artificial lighting.

3. Unlike the previous Part J the deemed-to-satisfy schedule does not repeat the *constructions* given in Part G which continues to have these details for designers wishing to use them. In this Part J the deemed-to-satisfy schedules concentrate on the thermal performance of the fabric and provides information to enable the most appropriate insulation measures to be selected.

4. As before, there are measures for *building* services. These now extend the requirements to automatic controls and insulation and, for *buildings* other than *dwellings*, make certain new requirements for lighting and artificial ventilation.

5. An important new requirement is for energy rating of *dwellings* which is intended to provide householders with an indication of the energy performance of different houses and flats.

6. Many factors were taken into account before these standards were set, not least the often considerable technical risks which can accompany improvements in thermal insulation. In this respect Part G (which deals with condensation) and Part K (ventilation) must be read in conjunction with this Part as these are all different aspects of the same *constructional* considerations and are only separated for ease of understanding. This interaction should be borne in mind when specifying a particular solution and it may be helpful for designers to refer simultaneously to BS 5250 (certain sections of which are deemed-to-satisfy specifications for some Technical Standards). It would also be prudent to take into account the principles contained in the Building Research Establishments Report, "Thermal Insulation: avoiding risks", 1993.

7. Finally, although all *construction* should have a high standard of workmanship it could be particularly important that special care be taken to ensure that inadvertent thermal bridging and obstruction of ventilation pathways does not occur during *construction* as these will almost certainly give rise to condensation problems at a later date.

Part J

Regulation 22

Conservation of fuel and power

22(A) (1) In a *building* to which this regulation applies, reasonable provision shall be made for the conservation of fuel and power.

(2) This regulation shall apply to every *building* other than -

(a) *a building* of *purpose groups* 2 to 7 inclusive which -

(i) is a *limited life building,*

(ii) has a total floor area not exceeding 30 square metres, or

(iii) is unheated or has a space heating system which is designed to give a maximum output not exceeding 25 watts per square metre of floor area;

(b) *a building* of one *storey* which has a fabric covering and is supported by a frame or by air pressure;

(c) a circulation and service area in *a building* comprising more than one *dwelling* which is not part of an individual *dwelling;*

(d) *a conservatory, greenhouse,* garage, store, wash-house, *watercloset compartment* and other accommodation which is ancillary to and forms part of a *building* of *purpose group* 1; and

(e) *a building* of *purpose groups* 6 or 7 which has a space heating system which is designed to give a maximum output not exceeding 50 watts per square metre of floor area.

22(B) (1) A *building* to which this regulation applies shall have written evidence as to its likely energy performance.

(2) This regulation shall apply to an individual *dwelling* of *purpose group* 1 other than -

(a) a circulation and service area in *a building* comprising more than one *dwelling* which is not part of an individual *dwelling*;

(b) *a conservatory, greenhouse*, garage, store, wash-house, *watercloset compartment* and other accommodation which is ancillary to and forms part of a *building* of *purpose group* 1; and

(c) an extension to an existing *dwelling*.

Part J
The standards

J1 Application of Part J

J1.1 This Part sets out the required standards for regulation 22. The standards require reasonable provision to be made, where appropriate, for conservation of fuel and power by the energy efficient *construction* of -

a. the fabric;

b. space heating and domestic hot water systems;

c. hot water storage vessels, pipes and *ducts*;

d. mechanical ventilation and air conditioning systems; and

e. artificial lighting.

J1.2 The standards in J2 apply to every *building*,
except -

a. a *building* or part of a *building* specified in regulation 22A(2). (Note that regulation 22 does apply even if the intended level of provision of heating cannot be established because the use of the *building* is not known at the *construction* stage, eg speculative development.);

b. J5.1 to J5.6 do not apply to a *building* of *purpose group* 1;

c. J5.1 and J5.2 do not apply to a *building* of *purpose groups* 2 to 7 which has a floor area of 500m^2 or less;

d. J5.3 to J5.6 do not apply to

   i. a *building* of *purpose groups* 2 to 7 which has a floor area of 100m^2 or less;

   ii. display lighting;

   iii. external lighting;

   iv. safety lighting; and

   v. non-maintained emergency lighting;

e. J3.4 and J3.5 do not apply to storage and piping systems for commercial or industrial purposes; and

f. J3.2 to J3.5 do not apply to a *building* -

   i. where the area heated is 125m^2 or less, or

   ii. where systems heat or store hot water for an industrial process.

J1.3 In this Part -

EXPOSED in relation to a *building* element means an element directly exposed to the outside air or a ground floor directly in contact with the ground or an underfloor space ventilated in accordance with Part G;

SEMI-EXPOSED in relation to a *building* element means an element between a *building* to which Part J applies and a *building* to which it does not apply; and

VENTILATED SPACE means a space which is enclosed by structure, part of which is exposed to the outside air and permanently ventilated to the outside air by openings or *ducts* having an aggregate area exceeding 30% of the wall area.

J2 Conservation of fuel and power: the *building* fabric

RULES FOR THE USE OF THIS SECTION

J2.1 In demonstrating that the technical standards are met the following rules apply -

a. no part of a floor, wall or roof may have a *U-value* in excess of 1.2;

b. the following are to be treated as *exposed* walls -

i. *external walls*, other than those enclosing a *ventilated space*,

ii. *semi-exposed* walls adjoining a *ventilated space*, and

iii. any part of a roof which has a pitch of 70° or more;

c. any part of a floor which serves as a roof (eg an open deck) is to be treated as a roof;

d. in calculating areas -

i. the area of a floor, wall or roof is to be the internal surface area of each element measured between finished internal faces of the enclosing fabric of the *building* ignoring any intermediate openings, partitions or floors and, in the case of a roof, in the plane of the insulation,

ii. the area of an opening for a door, window or rooflight is to be measured internally from reveal to reveal and from head to cill,

iii. in a *building* of *purpose group* 1 the floor area and the area of *glazed* openings of any ancillary accommodation referred to in regulation 22 may be ignored, and

iv. in a shop, display windows at an access level may be ignored;

e. any part of an *exposed* wall which extends below the level of the lowest floor or above the level of a roof which has the required *U-value* may be ignored;

f. calculation of *U-values* must take into account masonry joints, timber studs and similar potential thermal bridges (see Appendix 1, page 38J); and

g. In the absence of manufacturer's information,thermal conductivities (W/mK) and thermal transmittances (U W/m^{2}K) may be taken from the tables in this Part. Values are given for the more common elements and provide a general indication of thermal performance. However,if certified test results for particular products are available these should be used in preference.

PERFORMANCE STANDARDS

J2.2 The *building* fabric must have provision for conservation of fuel and power in accordance with -

a. J2.3 to J2.6 (Method 1), or, J2.7 to J2.9 (Method 2), or, J2.10 (Method 3); and

b. J2.11 and J2.12

ELEMENTAL APPROACH (METHOD 1)

J2.3* Under this method the specified elements of a *building* must conform to, for a *building* of -

a. *purpose group* 1, J2.4 and J2.6; and

b. *purpose groups* 2 to 7, J2.5 and J2.6.

J2.4 The specified elements of a *building* of *purpose group* 1 must be in accordance with the tables to this standard.

Table 1 to J2.4: *U-values* of elements and areas of openings

Purpose group [Note 1]	**Minimum *U-Values* (W/m²K)** *exposed* **walls**	*exposed* **floors** [Note 2]	*semi-exposed* **walls and floors** [Note 3]	**pitched roofs with a roof space**	**flat roofs and roofs with attic** *rooms*	**windows, doors and rooflights** [Note 4]	**Minimum area of** *glazing* **and doors as % of total floor area** [Note 4]
1	0.45	0.45	0.6	0.25	0.35	3.3	20%
[higher standards for consultative comment]	[0.35		0.2]				

Notes:

1. In a *building* of *purpose group* 1 ancillary accommodation referred to in regulation 22A(2) (c) and (d) may be ignored.
2. Floors next to the ground may achieve the required *U-value* without the addition of insulation, see the diagram to J2.6 and Appendix 2 on page 42J.
3. The *U-values* for *semi-exposed* elements apply only to elements between a *building* to which this Part applies and a *building* or part of a *building* to which this Part does not apply.
4. 3.3 W/m²K and 20% are indicative values for double *glazing* and doors. Where those elements have better *U-values* (see Table 2 to this standard) then the maximum area may be amended (see Table 3 to this standard). Single *glazing* with secondary *glazing* may be used provided that it has comparable performance.

Table 2 to J2.4: Indicative *U-values* for *glazed* areas and doors

Item	**Frame type**			
	wood	**metal**	**thermal break**	**PVC-U**
Windows [Note 1]				
single *glazed*	4.7	5.8	5.3	4.7
double *glazed*	3.0	3.8	3.3	3.0
double *glazed* (low E)	2.4	3.2	2.6	2.4
double *glazed* (argon fill)	2.9	3.7	3.2	2.9
double *glazed* (low E and argon fill)	2.2	2.9	2.4	2.2
triple *glazed*	2.4	3.2	2.6	2.4
Doors [Note 2]				
solid timber panel	3.0			
half single *glazed*	3.7			
half double *glazed*	3.0			
fully double *glazed*	3.0	3.8	3.3	3.0

Notes:

1. The indicative values for double *glazing* are based on sealed units with a 12mm gap.
2. *Exposed* doors with single-*glazed* panels are acceptable provided that they do not increase the average *U-value* for windows, doors and rooflights beyond 3.3 W/m²K. Doors and windows with single-*glazed* panels protected by, enclosed draught-proofed spaces (which may be unheated) can be assumed to have a *U-value* of 3.3 W/m²K.

Table 3 to J2.4: Permitted variation in *glazed* areas and doors

Area-weighted average *U-value* (W/m²K)	total area of windows, doors and rooflights as % of floor area
2.0	37%
2.1	35%
2.2	33%
2.3	31%
2.4	29%
2.5	28%
2.6	27%
2.7	25%
2.8	24%
2.9	23%
3.0	22%
3.1	22%
3.2	21%
3.3	20%
3.4	19%
3.5	19%
3.6	18%
3.7	18%
3.8	17%
3.9	17%
4.0	16%
4.1	16%
4.2	15%
4.3	15%
4.4	14%
4.5	14%
4.6	14%
4.7	13%
4.8	13%
4.9	13%
5.0	13%

J2.5 The specified elements of a *building* of *purpose groups* 2 to 7 must be in accordance with the tables to this standard.

Table 1 to J2.5: ***U-values*** **of elements and areas of openings**

Purpose group	**Minimum *U-Values* (W/m^{2}K)**						**Max area of windows and personnel doors as % of total floor area**	**Max area of rooflights as % of roof area**
	***exposed* walls**	***exposed* floors** [Note 1]	***semi-exposed* walls and floors** [Note 2]	**roofs**	**windows rooflights and personnel doors** [Note 3]	**vehicle and large doors** [Note 4]	[Note 3]	
2	0.45	0.45	0.6	0.35 [Note 5]	3.3	[0.7]	30%	20%
3, 4, 5	0.45	0.45	0.6	0.45	3.3	[0.7]	40%	20%
6, 7	0.45	0.45	0.6	0.45	3.3	[0.7]	15%	20%

Notes:

1. Floors next to the ground may achieve the required *U-value* without the addition of insulation, see the diagram to J2.6 and Appendix 2 on page 42J.
2. The *U-values* for *semi-exposed* elements apply only to elements between a *building* to which this Part applies and a *building* or part of a *building* to which this Part does not apply.
3. 3.3 W/m^{2}K and the related percentages are indicative values for double *glazing* and doors. Where these elements have better *U-values* (see Table 2 to this standard) then the maximum area may be amended (see Table 3 to this standard). Single *glazing* with secondary *glazing* may be used provided that it has comparable performance. In a shop, display windows at an access level may be ignored.
4. There are no specific areas for vehicle and large doors as these will have to be provided to suit requirements of use.
5. For pitched roofs on a *building* of *purpose group* 2 with a roof space the *U-value* must be 0.25.

Table 2 to J2.5: Indicative *U-values* for *glazed* areas and personnel doors

Item	Frame type			
	wood	metal	thermal break	PVC-U
Windows [Note 1]				
single *glazed*	4.7	5.8	5.3	4.7
double *glazed*	3.0	3.8	3.3	3.0
double *glazed* (low E)	2.4	3.2	2.6	2.4
double *glazed* (argon fill)	2.9	3.7	3.2	2.9
double *glazed* (low E & argon fill)	2.2	2.9	2.4	2.2
triple *glazed*	2.4	3.2	2.6	2.4
Personnel doors [Note 2]				
solid timber panel	3.0			
half single *glazed*	3.7			
half double *glazed*	3.0			
fully double *glazed*	3.0	3.8	3.3	3.0

Notes:

1. The indicative values for double glazing are based on sealed units with a 12mm gap.
2. *Exposed* personnel doors with single-*glazed* panels are acceptable provided that they do not increase the average *U-value* for windows, personnel doors and rooflights beyond 3.3 W/m²K. Personnel doors and windows with single-*glazed* panels protected by, enclosed, draught-proofed spaces (which may be unheated) can be assumed to have a *U-value* of 3.3 W/m²K.

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Table 3 to J2.5: Permitted variation in *glazed* areas and personnel doors

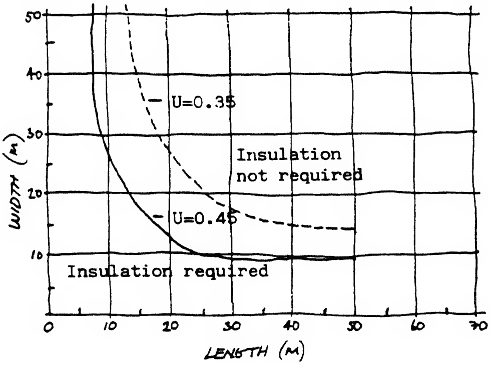
Area-weighted average *U-value* (W/m^{2}K)	*Purpose groups* 2	3,4	6 & 8	**Rooflights (all *purpose groups*)**
	% of wall area			% of roof area
2.0	55	74	28	37
2.1	52	69	26	35
2.2	49	65	24	33
2.3	46	62	23	31
2.4	44	58	22	29
2.5	42	56	21	28
2.6	40	53	20	27
2.7	38	51	19	25
2.8	36	49	18	24
2.9	35	47	17	23
3.0	34	45	17	22
3.1	32	43	16	22
3.2	31	41	15	21
3.3	30	40	14	20
3.4	29	39	14	19
3.5	28	37	14	19
3.6	27	36	13	18
3.7	26	35	13	18
3.8	26	34	12	17
3.9	25	33	12	17
4.0	24	32	12	16
4.1	23	31	11	16
4.2	23	30	11	15
4.3	22	30	11	15
4.4	22	29	11	14
4.5	21	28	11	14
4.6	21	27	10	14
4.7	20	27	10	13
4.8	20	26	10	13
4.9	19	26	10	13
5.0	19	25	9	13

FLOOR INSULATION

J2.6 A floor must be insulated as required by the diagram to this standard to achieve a *U-value* of 0.45 [0.35].

[higher standards for consultative comment]

Diagram to J2.6: Floor dimensions for which insulation is required



For detached *buildings* the dimensions relate directly to the *building*. For semi-detached and terraced *buildings* and blocks of flats the dimensions relate to the floor area under the whole *building*.

See Appendix 2, on page 42J for calculation method.

BUILDING FABRIC TARGET APPROACH (METHOD 2)

J2.7 Under this method the performance of the fabric of a *building* must conform to, for a *building* of-

a. *purpose group* 1, J2.8; and

b. *purpose groups* 2 to 7, J2.9.

J2.8 The calculated average *U-value* of a *building* of *purpose group* 1 must not exceed a target *U-value* given by the following formula -

$$\frac{\text{total floor area (m}^2\text{) x 0.57}}{\text{total } exposed \text{ surface area (m}^2\text{)}} + 0.4$$

where,

total floor area = the floor area of all floors of the *building* measured between finished internal faces of *external walls* disregarding partitions, *ducts* and stairwells.

[higher standards for consultative comment]

total exposed surface area = the total internal surface area of the *exposed* elements of the *building* and including windows, doors, rooflights and the ground floor but excluding *semi-exposed* elements. *Semi-exposed* elements must have a *U-value* of 0.6 [0.45] and be omitted from the calculation. Areas are measured between finished internal faces and, for roofs, in the plane of the insulation.

The formula assumes an equal distribution of *glazing* on north and south elevations. (For this purpose north and south are taken as being between 30° to the east and 30° to the west of true north and south.) Where the actual area of *glazing* facing south, exceeds that facing north, then the *glazed* area for the purposes of the calculation can be taken as. the total *glazed* area - 20% of the difference between north and south *glazing*.

The formula also assumes that space and water heating is by a standard gas boiler or other equivalent heating system. Where a heating system with a high efficiency is used, eg a condensing boiler, the requirements of the target *U-value* can be altered by 5% to give a less demanding standard

J2.9 The calculated average *U-value* of a *building* of *purpose groups* 2 to 7 must not exceed a target *U-value* given by the following formula -

$$\frac{\text{total } exposed \text{ wall area (m}^2\text{) x Y}}{\text{total } exposed \text{ surface area (m}^2\text{)}} + Z$$

where,

total *exposed* wall area = the total internal surface area of the *exposed* elements of the *building* including windows, personnel doors and the ground floor but excluding vehicle access and similar large doors and *semi-exposed* elements.

total *exposed* surface area = the total internal surface area of the *exposed* elements of the *building* including windows, personnel doors, rooflights and the ground floor but excluding *semi-exposed* elements and vehicle access or similar large doors. *Semi-exposed* elements and large doors must have a *U-value* of 0.6 and 0.7 respectively. Areas are measured between finished internal faces and, for roofs, in the plane of the insulation.

Y & **Z** are factors which must be in accordance with the table to this standard.

Table to J2.9: Values of Y & Z

Purpose Group	**Y**	**Z**
2	0.62	0.69
3, 4, 5	0.86	0.74
6, 7	0.14	0.74

ENERGY USE (METHOD 3)

J2.10 Under this method the calculated annual energy consumption of a *building* must not be more than the calculated annual energy consumption of the *building* if it were to comply with Method 1 or Method 2 as appropriate.

Using this method the following rules apply (in addition to those at J2.1). -

a. if the total area of *glazed* openings in the *building* is less than that permitted in the elemental approach, then the smaller area must also be used in the comparative calculation; and

[higher standards for consultative comment]

b. if the *U-value* of the floor next to the ground, without insulation, is less than 0.45 [0.35 for *purpose group* 1 and 0.45 for *purpose groups* 2 to 7.], then the lower value must also be used in the comparative calculation.

For a *building* of *purpose group 1,* use the calculation method given in BRE Report, BR150, 1989, "Building Regulations: Conservation of fuel and power - the 'energy target' method of compliance for *dwellings.*"

For a *building* of *purpose groups* 2 to 7 which is naturally ventilated use the calculation method given in the CIBS Building Energy Code, Part 2", Section (a) 1981 published by the Chartered Institution of Building Services Engineers.

LIMITING INFILTRATION

J2.11 The infiltration of air into a *building* must be prevented as far as is *reasonably practicable* by sealing-

a. at junctions between structural elements;

b. suspended floors over ventilated voids and intermediate suspended floors at junctions with walls;

c. dry linings to the sub-structure around openings and at junctions with ceilings and floors;

d. gaps in membranes, linings and finishings especially in timber-framed *buildings* at joints with floors, walls and ceilings;

e. around loft hatches and service penetrations including electrical terminal boxes, sockets and ceiling roses; and

f. by draught stripping all opening elements such as doors, windows and rooflights and sealing junctions between their frames and enclosing elements.

J3 Conservation of fuel and power: the *building* services

CONTROLS FOR HEATING SYSTEMS

J3.1* In a *building* of *purpose group* 1 to which this Part applies the heating system must be provided with controls in accordance with points a. to c. of this standard.

In a *building* of *purpose groups* 2 to 7 to which this Part applies the heating system must be provided with controls in accordance with points a. to d. of this standard.

a. i. *room* thermostats, or

  ii. thermostatic heater control valves, or

  iii. any other similar temperature sensing or control device or devices for separate use areas of the *building* (eg sitting rooms and bedrooms);

b. a timing device, or devices, which control the periods when the heating system is in operation;

c. in a wet central heating system, a means of automatically switching the boiler off when no heat is required (controls may be provided to allow sufficient heating to prevent damage to the *building*, services or contents, by frost, excessive humidity or condensation); and

d. where a heating system has two or more gas or oil fired boilers which can work together and have a total load of more than 100kW to supply the heat demand, boiler controls must be installed to provide sequence control and the hydraulic design must ensure stable control

CONTROLS FOR HOT WATER STORAGE VESSELS

J3.2 A hot water storage vessel (other than one heated by solid fuel) must -

a. be fitted with an adjustable thermostat which can regulate the maximum temperature of the stored water; and

b. if the vessel is not heated by off-peak electricity, an adjustable time control which can switch the supply of fuel on and off.

INSULATION OF HOT WATER STORAGE VESSELS

J3.3 Hot water storage vessels must be pre-insulated with 40mm of polyurethane foam insulation or other insulant to provide an equivalent performance, -
except -

where systems heat or store water for an industrial process.

INSULATION OF PIPES AND *DUCTS*

J3.4* Heating and hot water pipes and warm air *ducts* must be adequately insulated against heat loss,
except -

a. where the heat loss will contribute to the requirements of the *room* or space; or

b. where systems heat or store water for an industrial process.

J4 STANDARD ASSESSMENT PROCEDURE

STANDARD ASSESSMENT PROCEDURE (see Appendix 6 on page 52J)

J4.1 A *building* of *purpose group* 1 must have an estimated likely energy consumption demonstrated by-

a. having a Standard Assessment Procedure (SAP) rating of not less than 60; or

b. where it has a SAP rating of less than 60 -

i. elemental *U-values* must be in accordance with the table to this standard.

Table to J4.1: ***U-values*** **of** ***elements***

Element	***U-value*** **(W/m²K)**
exposed walls	0.45
exposed floors and ground floors	0.35
pitched roofs	0.20
flat roofs and roofs with attic rooms	0.35
semi-exposed walls and floors	0.45
windows, doors and rooflights (area weighted average)	3.00

or

ii. the calculated average target *U-value* of a *building* of *purpose group* 1 must be changed from that given in J2.8 to -

$$\frac{\text{total floor area (m}^2\text{)} \times 0.51}{\text{total exposed surface area (m}^2\text{)}} + 0.36$$

11/18/92

J5 Conservation of fuel and power: artificial ventilation and lighting

ARTIFICIAL VENTILATION

J5.1* A *building* of *purpose groups* 3, 4 or 6 which is not excluded by regulation 22(A)(2) may only be provided with an air conditioning or mechanical ventilation system where -

a. a natural ventilation system is not *reasonably practicable*; and

b. such a system can be *constructed* to ensure the conservation of fuel and power.

J5.2* An artificial ventilation system must be tested [and commissioned] to demonstrate efficient operation.

[point for particular consultativ comment]

ARTIFICIAL LIGHTING

J5.3 An artificial lighting system in a *building* of *purpose groups* 3, 4 or 6 which is not excluded by regulation 22(A)(2) must be in accordance with J5.4 or J5.5.

J5.4 A *building* or part of a *building* of *purpose groups* 3, 4 or 6 must have a minimum *glazed* area in accordance with table 1 to this standard and lamps in accordance with table 2.

Table 1 to J5.4: *Glazed* areas

Type of *glazing*	**Light transmission factor**	**Area of windows and rooflights as % of floor area** [Note 1]
clear double	0.77	10%
other (eg tinted)	x	$\frac{7.7}{x}$ [Note 2]

Notes:

1. Where the *glazed* area is less than those required by this column then the lighting must be in accordance with J5.5.

2. x is the light transmission factor of the *glazing* being used. Eg for tinted *glazing* with a light transmission factor of 0.4, the minimum *glazed* area would be $\frac{7.7}{0.4} = 19.25\%$

All light factors to be measured at normal incidence.

Table 2 to J5.4: High efficiency lamps [Note 1]

Light source	Type
high pressure sodium	all except white SON
metal halide	all
tubular fluorescent (T8 & T12)	all those controlled by high frequency ballasts
compact fluorescent	all those rated at 11W or more
induction lighting	all

Note:

1. Lamps with lower efficiencies may be used provided that -
   a. the total *glazed* areas comply with Table 1; and
   b. the average efficacy of all the lamps in the *building* is not less than 50 lumens/circuit-Watt.

J5.5 A *building* or part of a *building* of *purpose groups* 3, 4 or 6 must have artificial lighting of an efficacy of 65 lumens/circuit Watt decreasing by 1.5 lumens/circuit Watt for each 1% (of floor area) of *glazing* with a light transmission factor of 0.77 measured at normal incidence (eg clear double *glazing).*

SWITCHING FOR ARTIFICIAL LIGHTING

J5.6* An artificial lighting system in a *building* of *purpose groups* 3, 4 or 6 not excluded by regulation 22(A)(2) must be operated by switches activating not more than 10 lamps/switch with no switch further than a horizontal distance equal to 3 times the height of the lamp above floor level.

A switch must be operated -

a. manually; or

b. by sensors, or

c. by timers, or

d. by any combination of a. to c.

Part J

Provisions deemed to satisfy the standards

ELEMENTAL APPROACH

(J2.3) The requirements of J2.3 will be met where the outer fabric is insulated as specified below.

The insulation required for an external fabric element is determined by -

a. finding the required *U-value* for the element from the tables for the elemental approach (J2.3 to J2.6);

b. selecting an appropriate insulation material;

c. finding the base thickness required from the tables in Section A; and

d. deducting the appropriate resistivities given in the tables in Section A

Examples of this procedure for some common *building* elements are given in Section B.

SECTION A

SECTION A1: WALLS

Table A1.1 - Base thickness of insulation layer to achieve *U-values* in the range 0.30 W/m²K to 0.6 W/m²K

	a	b	c	d	e	f	g	h
	Design *U-value* (W/m²K)	Thermal conductivity of insulant (W/m.K)						
		0.020	0.025	0.030	0.035	0.040	0.045	0.050
		Base thickness of insulating material (mm)						
1	0.30	63	79	95	110	126	142	158
2	0.35	54	67	80	94	107	120	134
3	0.40	46	58	70	81	93	104	116
4	0.45	41	51	61	71	82	92	102
5	0.60	30	37	45	52	59	67	74

Table A1.2 - Proportions of base thickness of insulation layer offset by common wall components

a	b	c	d	e	f	g	h	i
Component	Resist. (m²K/W)	Thermal conductivity of insulant (W/m.K)						
		0.02	0.025	0.03	0.035	0.04	0.045	0.05
		Reduction in base thickness of insulating material (mm)						
1 Cavity	0.18	4	5	5	6	7	8	9
2 Outer leaf brick	0.14	3	4	4	5	6	6	7
3 13mm Plaster	0.03	1	1	1	1	1	1	1
4 13mm Ltwt. plaster	0.09	2	2	3	3	4	4	5
5 10mm plasterboard	0.06	1	1	2	2	2	3	3
6 13mm plasterboard	0.08	2	2	2	3	3	4	4
7 19mm sheathing ply	0.14	3	3	4	5	5	6	7
8 20mm cement render	0.04	1	1	1	1	2	2	2
9 13mm Tile hanging	0.02	0	0	0	1	1	1	1

Table A1.3 - Proportion of base thickness of insulation layer offset by concrete wall components (per 100mm thickness)

	a	b	c	d	e	f	g	h	i	j
		Density	**Resist.**	**Thermal conductivity of insulant (W/m.K)**						
		(kg/m^3)	**(m^{2}K/W)**	**0.02**	**0.025**	**0.03**	**0.035**	**0.04**	**0.045**	**0.05**
				Reduction in base thickness of insulating material (mm) for each 100mm of leaf						
1)		600	0.43	9	11	13	15	17	20	22
2)		800	0.37	7	9	11	13	15	17	19
3)	Concrete	1,000	0.30	6	8	9	11	12	14	15
4)	inner	12,000	0.25	5	6	7	9	10	11	12
5)	leaf	1,400	0.19	4	5	6	7	8	9	9
6)		1,600	0.15	3	4	4	5	6	7	7
7)		600	0.42	8	10	13	15	17	19	21
8)	Concrete	800	0.34	7	8	10	12	14	15	17
9)	outer	1,000	0.28	6	7	8	10	11	12	14
10)	leaf	1,200	0.22	4	6	7	8	9	10	11
11)	or solid	1,400	0.17	3	4	5	6	7	8	9
12)	wall	1,600	0.14	3	3	4	5	5	6	7
13)		1,800	0.11	2	3	3	4	4	5	5
14)		2,000	0.08	2	2	2	3	3	4	4
15)		2,400	0.05	1	1	2	2	2	2	3

Table A1.4 - Proportion of base thickness of insulation layer offset by timber frame walls, per 100mm thickness of frame and insulation. [Note 1]

	a	b	c	d	e	f	g	h	i
	Insulation within frame								
	Conduct. (W/mK)	**Resist. (m^{3}K/W)**	**Thermal conductivity of insulant (W/m.K)**						
			0.02	0.025	0.03	0.035	0.04	0.045	0.05
			Reduction in base thickness of insulation (mm) for each 100mm of leaf						
1	0.035	2.08	42	52	62	73	83	94	104
2	0.040	1.90	38	48	57	67	76	86	95

Note 1: The table is derived for walls comprising 50mm wide studs @ 400mm centres ignoring any strutting. If the improved performance obtained by frame members at wider centres is to be taken into account use method 3, Energy Use in J2.10.

SECTION A2: FLOORS

TABLE A2.1 - Solid concrete floors in contact with the ground

	a	b	c	d	e	f	g	h	i	j
	Design *U-value* (W/m^2K)	Ratio of Floor Perimeter (m) to Floor Area (m^2)								
		0.27	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
		Insulation thickness required (mm) when thermal conductivity is 0.08 W/Mk								
1	0.25	143	157	190	210	223	232	239	244	247
2	0.35	51	66	98	118	131	141	147	152	156
3	0.45	1	15	47	67	81	90	97	102	105
4	0.60	*	*	3	23	36	46	52	57	61
5	1.10	*	*	*	*	*	*	*	*	*
		Insulation thickness required (mm) when thermal conductivity is 0.04 W/Mk								
6	0.25	71	79	95	105	111	116	119	122	124
7	0.35	26	33	49	59	66	70	74	76	78
8	0.45	0	7	24	34	40	45	48	51	53
9	0.60	*	*	2	11	18	23	26	29	30
10	0.10	*	*	*	*	*	*	*	*	*
		Insulation thickness required (mm) when thermal conductivity is 0.035 W/Mk								
11	0.25	63	69	83	92	98	102	105	107	108
12	0.35	23	29	43	52	58	62	65	67	68
13	0.45	0	6	21	30	35	39	42	44	46
14	0.60	*	*	1	10	16	20	23	25	27
15	1.10	*	*	*	*	*	*	*	*	*
		Insulation thickness required (mm) when thermal conductivity is 0.025 W/Mk								
16	0.25	45	49	59	66	70	73	75	76	77
17	0.35	16	21	31	37	41	44	46	48	49
18	0.45	0	5	15	21	25	28	30	32	33
19	0.60	*	*	1	7	11	14	16	18	19
20	1.10	*	*	*	*	*	*	*	*	*

TABLE A2.2 - Suspended ground floors

	a	b	c	d	e	f	g	h	i	j
	Design *U-value* (W/m^{2}K)	Ratio of Floor Perimeter (m) to Floor Area (m^2)								
		0.27	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
		Insulation thickness required (mm) when thermal conductivity is 0.04 W/Mk								
1	0.25	86	95	115	127	135	140	144	147	149
2	0.35	31	40	59	71	79	85	89	92	94
3	0.45	0	9	29	41	49	54	58	61	63
4	0.60	*	*	2	14	22	28	32	34	37
5	1.10	*	*	*	*	*	*	*	*	*
		Insulation thickness required (mm) when thermal conductivity is 0.035 W/Mk								
6	0.25	71	79	95	105	111	116	119	122	124
7	0.35	26	33	49	59	66	70	74	76	78
8	0.45	0	7	24	34	40	45	48	51	53
9	0.60	*	*	2	11	18	23	26	29	30
10	1.10	*	*	*	*	*	*	*	*	*
		Insulation thickness required (mm) when thermal conductivity is 0.025 W/Mk								
11	0.25	63	69	83	92	98	102	105	107	108
12	0.35	23	29	43	52	58	62	65	67	68
13	0.45	0	6	21	30	35	39	42	44	46
14	0.60	*	*	1	10	16	20	23	25	27
15	1.10	*	*	*	*	*	*	*	*	*

SECTION A3: ROOFS

TABLE A3.1 - Pitched roofs with insulation between ceiling joists or between rafters

	a	b	c	d	e	f	g	h
	Design *U-value* (W/m²K)	Thermal conductivity of insulant (W/Mk)						
		0.20	0.025	0.030	0.035	0.040	0.045	0.050
		Base thickness of insulating material (mm)						
1	0.20	172	215	258	301	345	388	431
2	0.25	116	145	175	204	233	262	291
3	0.30	88	109	131	153	175	197	219
4	0.35	70	87	105	122	140	157	175
5	0.40	58	73	87	102	116	131	145
6	0.45	50	62	74	87	99	111	124

TABLE A3.2 - Pitched roofs with 100mm of insulation between ceiling joists with added insulation laid over or under joists or rafters

	a	b	c	d	e	f	g	h
	Design *U-value* (W/m²K)	Thermal conductivity of insulant (W/Mk)						
		0.20	0.025	0.030	0.035	0.040	0.045	0.050
		Base thickness of insulating material (mm)						
1	0.20	26	45	65	87	109	131	154
2	0.25	6	20	35	52	69	86	104
3	0.30	*	3	15	28	42	56	70
4	0.35	*	*	1	12	23	35	47
5	0.40	*	*	*	*	9	19	29
6	0.45	*	*	*	*	*	6	15

TABLE A3.3 - Roofs having continuous insulation

	a	b	c	d	e	f	g	h
	Design *U-value* (W/m²K)	Thermal conductivity of insulant (W/Mk)						
		0.20	0.025	0.030	0.035	0.040	0.045	0.050
		Base thickness of insulating material (mm)						
1	0.20	97	122	146	170	194	219	243
2	0.25	77	97	116	135	154	174	193
3	0.30	64	80	96	112	128	144	160
4	0.35	54	68	82	95	109	122	136
5	0.40	47	59	71	83	94	106	118
6	0.45	42	52	62	73	83	94	104

Table A3.4 - Proportions of base thickness of roof insulation offset by common roof components

	a	b	c	d	e	f	g	h	i	j
		Density (kg/m³)	Rest. (m²K/W)	Thermal conductivity of insulant (W/m.K)						
				0.020	0.025	0.030	0.035	0.040	0.045	0.050
				Reduction in base thickness of insulating material (mm)						
1	10mm plasterboard		0.06	1	1	2	2	2	3	3
2	13mm plasterboard		0.08	2	2	2	3	3	3	4
3	13mm sarking board		0.09	2	2	3	3	4	4	5
4	Roof space (pitched)		0.18	4	5	5	6	7	8	9
5	Roof space (flat)		0.16	3	4	5	6	6	7	8
6	19mm roofing tiles		0.02	0	1	1	1	1	1	1
7	19mm asphalt (or 3 layers of felt)		0.04	1	1	1	1	2	2	2
8	50mm screed		0.12	2	3	4	4	5	5	6
9	Concrete slab	600	0.53	11	13	16	18	21	24	26
10		800	0.43	9	11	13	15	17	20	22
11		1,100	0.29	6	7	9	10	12	13	15
12		1,300	0.23	5	6	7	8	9	10	11
13		1,700	0.13	3	3	4	5	5	6	7
14		2,100	0.08	2	2	2	3	3	4	4

SECTION B

B1: Masonry wall with internal insulation

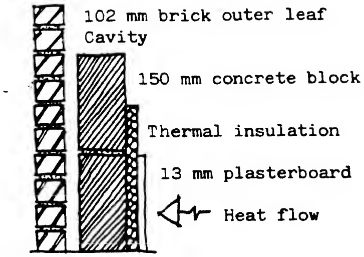


Figure B1

The *U-value* required for use in the Elemental Approach is 0.45 W/m²K. [Note 1]

It is proposed to use thermal insulation with a conductivity of 0.025 W/mK.

From Table A1.1 (Column c, row 4) the base thickness of the insulation layer is 51mm.

Reductions in Base thickness are obtained as follows:

from Table A1.2:-

Brick outer leaf	= 4mm	(Col d, row 2)
Cavity	= 5mm	(Col d, row 1)
Plasterboard	= 2mm	(Col d, row 6)

and from Table A1.3:-

Concrete block, 11 x 1.5 (density = 600kg/m³)	= 17mm	(Col e, row 1 adjusted for 150mm block thickness)
Total reduction	= 28mm	

The minimum thickness of the insulation layer required to achieve a *U-value* of 0.45 W/m²K is therefore:-

Base Thickness less Total Reduction

ie (51 - 28) = **23mm**

The nearest suitable standard thickness will be 25mm

Note 1: *U-values* are calculated by the proportional area method.

B2: Masonry wall with internal insulation

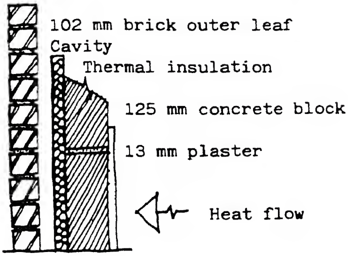


Figure B2

The *U-value* required for use in the Elemental Approach is 0.45 W/m²K [Note 1]

It is proposed to use mineral fibre batts with a conductivity of 0.035 W/mK.

From Table A1.1 (Column e, row 4) Base thickness of insulation layer is 71mm.

Reductions in Base thickness are obtained as follows.

Reductions in base thickness are obtained

from Table A1.2 -

Brick outer leaf	= 5mm	(Col f, row 2)
Cavity	= 6mm	(Col f, row 1)
Plaster	= 1mm	(Col f, row 3)

and from Table A1.3:-

Concrete block: 1.25 x 11 (Density = 1,000 kg/m³)	= 14mm	(Col g, row 3)

Total reduction = 26mm

The minimum thickness of the insulation layer required to achieve a *U-value* of 0.45 W/m²K is therefore -

Base Thickness less Total Reduction

ie 71 - 26 = **45mm**

The nearest suitable standard thickness will be 50mm thick.

Note 1 *U-values* are calculated by the proportional area method.

(J2.3)

B3: Semi-exposed solid wall

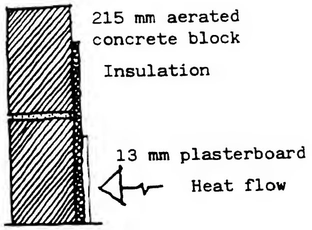


Figure B3

The *U-value* required for use in the Elemental Approach is 0.6 W/m²K. [Note 1]

It is proposed to dry-line the wall with insulation having a thermal conductivity of 0.02 W/mK.

From Table A1.1 (Column b, row 5) Base thickness of insulation layer is 30mm.

Reductions in Base thickness are obtained as follows:

Reductions in base thickness are obtained

from Table A1.2:-

Plasterboard	= 2mm	(Col d, row 6)

and from Table A1.3:-

Concrete block, 8 x 2.15 (Density = 600 kg/m³)	= 17mm	(Col d, row 7 adjusted for 215mm block thickness)
Total reduction	= 19mm	

The minimum thickness of the insulation layer required to achieve a *U-value* of 0.6 W/m²K is therefore -

Base Thickness less Total Reduction

ie 30 - 19 = **11mm**

The nearest suitable standard thickness will be 13mm.

Note 1: *U-values* are calculated by the proportional area method.

B4: Timber-frame wall

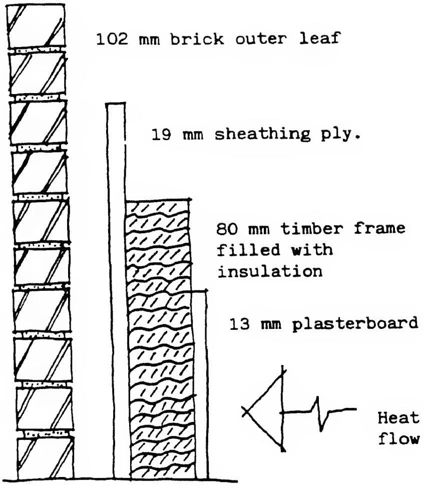


Figure A5

The *U-value* required for use in the Elemental Approach is 0.45 W/m^2K. [Note 1]

It is proposed to fill the space between timber frame members with insulation having a thermal conductivity of 0.035 W/mK.

From Table A1.1 (Column e, row 4) Base thickness of the insulation layer is 71mm.

The frame thickness is 80mm therefore for a *U-value* of 0.45 W/m^2K no additional insulation is required.

If it is desired to increase the standard of insulation by reducing the *U-value* to 0.35W/m^2K (as part of a target approach calculated for instance), the Base thickness of insulation from Table A1.1 (Col e, row 2) would be 94mm. Reductions in thickness are obtained from Table A1.2:-

Brick outer leaf	= 5mm	(Col f, row 2)
Cavity	= 6mm	(Col f, row 1)
Sheathing ply	= 5mm	(Col f, row 7)
Plasterboard	= 3mm	(Col f, row 6)

and from Table A1.4:-

Timber frame: 0.8 x 73	= 58mm	(Col f, row 1 adjusted for shallower member)

Total reduction = 77mm

The minimum thickness of insulation required in addition to the insulation between frame members to achieve a *U-value* of 0.45 W/m^2K is therefore:-

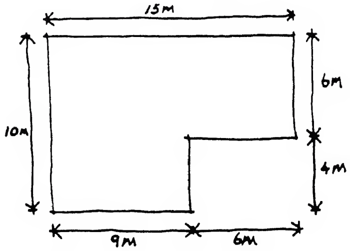
Base Thickness less Total Reduction

ie 94 - 77 = **17mm**

To obtain a *U-value* of 0.35 W/m^2K the frame member depth would need to be increased to 100mm to accommodate extra insulation or a dry lining could be added.

Note 1 *U-values* are calculated by the proportional area method.

B5: Ground-supported concrete floor



The ground floor slab in the figure is to be insulated following the Elemental Approach to achieve a *U-value* of 0.45 W/m²K.

It is proposed to use insulation with a thermal conductivity of 0.025 W/mK.

The calculations are as follows:

Figure B5
Dimensions in metres

The overall perimeter length of the slab is:-

15 + 6 + 6 + 4 + 9 + 10 = 50m

The area of the slab is (6 x 6) + (10 x 9) = 126m²

The ratio $\frac{\text{(Perimeter length)}}{\text{(Floor area)}} = \frac{50}{126} = 0.4$

Table A2.1, Col d, row 18 indicates 15mm of insulation is required.

The nearest standard thickness of insulation will be 25mm. It may be located above or below the concrete slab.

B7: **Suspended floor (timber or concrete)**

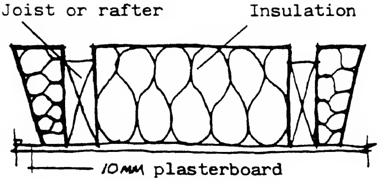
If the floor in example B5 was suspended, the perimeter length and floor area would be the same, yielding the same ratio of

$$\frac{\text{(Perimeter length)}}{\text{(Floor area)}} = \frac{50}{126} = 0.4$$

To achieve a *U-value* of 0.45 W/m²K for the Elemental Approach using insulation with a thermal conductivity of 0.025 W/mK, Table A2.2 (Col d, row 13) indicates insulation thickness should be not less than 21mm.

The nearest suitable standard thickness of insulation will be 25mm.

B6: Pitched roof with insulation between ceiling joists or between rafters



The *U-value* required for the Elemental Approach is 0.25 W/m²K if the insulation is between joists or 0.35 W/m²K if the insulation is between the rafters.

It is proposed to use insulation with a thermal conductivity of 0.030 W/mK.

Reductions in Base thickness are obtained as follows:

Figure B6

For insulation as shown in Figure B6 placed between joists

From Table A3.1 (Col d, row 2) the Base thickness of insulation required is 175mm.

Reductions in the base thickness are obtained

from Table A3.4

19mm roof tiles	= 1mm	(Col f, row 6)
Loft airspace	= 5mm	(Col f, row 4)
9.5mm plasterboard	= 2mm	(Col f, row 1)
Total reduction	= 8mm	

The minimum thickness of the insulation layer between the ceiling joists required to achieve a *U-value* of 0.25W/m²K is therefore:-

Base Thickness less Total Reduction

ie 175 - 8 = **167mm**

The nearest suitable standard thicknesses of insulation will be 175mm.

For insulation as shown in Figure B6 placed between rafters.

From Table A3.1 (Col d, row 4) the Base thickness of insulation required is 105mm.

Reductions in the base thickness are obtained

from Table A3.4 -

19mm roof tiles	= 1mm	(Col f, row 6)
10mm plasterboard	= 2mm	(Cof f, row 1)
Total reduction	= 3mm	

11/18/92

The minimum thickness of the insulation layer between the rafters required to achieve a *U-value* of 0.35 W/m^{2}K is therefore

Base Thickness less Total Reduction

ie 105 - 3 = **102mm**

The nearest suitable standard thickness of insulation will be 125mm.

B7: **Pitched roof with insulation between and over ceiling joists.**

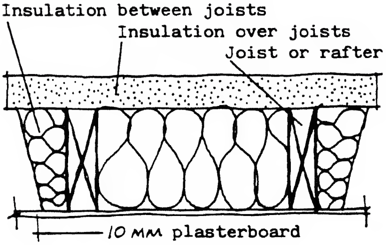


Figure B7

The *U-value* required for use in the Elemental Approach is 0.25 W/m^{2}K.

It is proposed to use mineral fibre insulation between and over the joists having a thermal conductivity of 0.035 W/mK.

From Table A3.2 (Column e, row 2) Base thickness of the insulation layer is 52mm.

Reductions in Base Thickness are obtained as follows:

From Table A3.4:-

19mm roof tiles	= 1mm	(Col g, row 6)
Loft airspace	= 6mm	(Col g, row 4)
10mm plasterboard	= 2mm	(Col g, row 1)
Total reduction	= 9mm	

The minimum thickness of the insulation layer over the joists required in addition to the insulation between the joists to achieve a *U-value* of 0.25 W/m^{2}K is therefore:-

Base Thickness less Total Reduction

ie 52 - 9 = **43mm**

The nearest suitable standard thickness of insulation layed over the joists will be 50mm.

B8: Industrial roof with outer sheeting

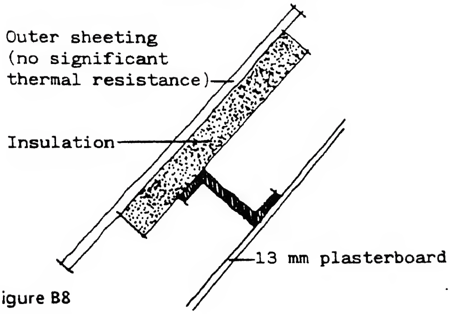


Figure B8

The *U-value* required for use in the Elemental Approach is 0.45 W/m²K.

It is proposed to use insulation with a thermal conductivity of 0.035 W/mK.

From Table A3.3 (Column e, row 6) the Base thickness of the insulation layer is 73mm.

Reductions in Base thickness are obtained as follows:

From Table A3.4:-

Outer sheeting	= negligible	
Air Space	= 6mm	(Col g, row 4)
13mm plasterboard	= 3mm	(Col g, row 2)
Total reduction	= 9mm	

The minimum thickness of the insulation layer required to achieve a *U-value* of 0.45 W/m²K is therefore:-

Base Thickness less Total Reduction

ie 73 - 9 = **64mm**

The nearest suitable standard thickness will be 65mm or 75mm.

(J2.3)

B9: Concrete deck roof

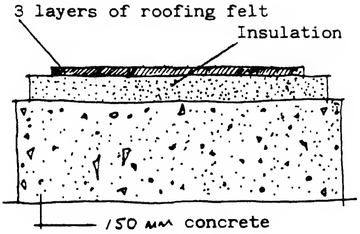


Figure B9

The *U-value* required for use in the Elemental Approach is 0.45 W/m²K

It is proposed to use insulation board with a thermal conductivity of 0.030 W/mK.

From Table A3.3 (Column d, row 6) the Base thickness of the insulation layer is 62mm.

Reductions in Base Thickness are obtained as follows:

From Table A3.4:-

3 layers of felt	= 1mm	(Col f, row 7)
150mm concrete deck: 1.5 x 9 (density = 1,100kg/m³) (adjusted fro 150mm thickness)	= 14mm	(Col f, row 11)
Total reduction	= 15mm	

The minimum thickness of the insulation layer required to achieve a *U-value* of 0.45 W/m²K is therefore:-

Base Thickness less Total Reduction

ie 62 - 15 = **47mm**

The nearest suitable standard thickness of insulation will be 50mm.

CONTROLS FOR HEATING SYSTEMS

(J3 1) The requirements of J3.1 will be met where the controls are in accordance with -

a. BS5449 (1990) "Specification for forced circulation hot water central heating systems for domestic premises"; or

b. BS5864 (1989) "Specification for installation in domestic premises of gas fired ducted air-heaters of rated output not exceeding 60kW".

INSULATION OF PIPES AND DUCTS

(J3 4) The requirements of J3.4 will be met where -

a. a pipe is insulated with a material having a thermal conductivity of not greater than 0.45 W/mK and a thickness equal to the outside diameter of the pipe up to a maximum thickness of 40mm; or

b. a pipe or *duct* is insulated in accordance with the relevant recommendations of BS5422: 1990, "Specification for the use of thermal insulating materials".

ARTIFICIAL VENTILATION

(J5.1) The requirements of J5.1 will be met where the requirements for justification of such a system set out in BRE Report No. xxx "The use of mechanical ventilation and air conditioning in non-domestic buildings" are met.

[A copy of this draft report is attached to this document for information.]

(J5.2) The requirements of J5.2 will be met where the system has been commissioned and tested in accordance with the relevant sections of the CIBSE Commissioning Codes.

ARTIFICIAL LIGHTING

(J5.6) The requirements of J5.6 will be met where the lighting controls are in accordance with the CIBSE Lighting Code.

Part J

Appendices

These Appendices are not part of the standards or the deemed-to-satisfy provisions: they give guidance on:

Appendix 1.	The calculation of *U-values* taking into account thermal bridging; page 38J;
Appendix 2.	Calculation of *U-values* for a floor; page 42J;
Appendix 3.	Calculation to determine the permissible area of windows, doors and rooflights in the elemental approach (Method 1); page 43J;
Appendix 4.	The *building* fabric target approach (Method 2); page 44J;
Appendix 5.	The energy use approach (Method 3); page 47J; and
Appendix 6.	The Standard Assessment Procedure for energy rating of *dwellings* (technical principles); page 52J.

Part J

Appendix 1

CALCULATION OF *U-VALUES* TAKING INTO ACCOUNT THERMAL BRIDGING

In calculating *U-values* for elements it is now necessary to take into account thermal bridges which can be created by thinner components such as motor joints and timber framing. The following example gives guidance on how this can be achieved.

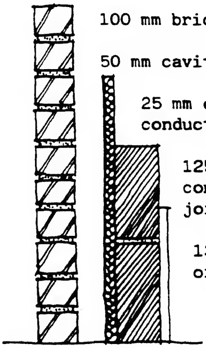
Calculation of *U-value* for a wall

A proposed *dwelling* has *U-values* for the main elements as follows -

Element	*U-value* (W/m^2K)
floor	0.45
windows	3.30
doors	3.30
roof	0.25

The proposed *dwelling* will satisfy the regulations provided the *U-value* of the *exposed* wall is equal to, or less than, 0.45 W/m^2K

The *construction* of the *exposed* wall is -



100 mm brick with thermal conductivity of 0.84 W/mK

50 mm cavity with thermal resistance of 0.18 sq.mK/W

25 mm of thermal insulation with thermal conductivity of 0.04 W/mK

125 mm block (440 mm x 215 mm) with thermal conductivity of 0.11 W/mK with 10 mm mortar joints having a thermal conductivity of 0.8W/mK

13 mm plasterboard with thermal conductivity of 0.16 W/mK

In addition the resistance of the outside surface of the wall is $0.06m^2K/W$ and of the inside surface, $0.12m^2K/W$.

APPENDIX 1

With this *construction* the thermal bridging of the blockwork by the dense mortar joints must be taken into account as follows -

Consider the wall as inner and outer leaves with the boundary between leaves as half way through the cavity.

Resistance of outer leaf

	m^2K/W
resistance of outside surface	0.06
resistance of brick outer leaf = 0.1/0.84	0.12
resistance of half of the cavity	0.09
Total resistance of outer leaf =	0.27

Resistance of inner leaf

Resistance of non-bridged layers	m^2K/W
resistance of half of the cavity	0.09
resistance of insulation material = 0.025/0.04	0.63
resistance of plasterboard = 0.013/0.16	0.08
resistance of inside surface	0.12
Total resistance of non-bridged layers (Rnb)	0.92

Resistance of bridged layers

resistance of block (Rb) = 0.125/0.11	1.14
resistance of mortar (Rm) = 0.125/0.8	0.16

Fraction of area which is block (Fb) =

$$\frac{440 \times 215}{450 \times 225} \qquad 0.934$$

Fraction of area which is mortar (Fm) =

$$(1 - Fb) \qquad 0.066$$

The sum of resistances in parallel is given by the formula:

$$\frac{1}{R\ \text{inner leaf}} = \frac{Fb}{(Rnb + Rb)} + \frac{Fm}{(Rnb + Rm)}$$

The figures in this case are:

$$\frac{1}{R\ \text{inner leaf}} = \frac{0.066}{(0.92 + 1.14)} + \frac{0.934}{(0.92 + 0.16)}$$

$$\frac{1}{R\ \text{inner leaf}} = 0.897\ W/m^2K$$

$$R\ \text{inner leaf therefore} = \frac{1}{0.897} = 1.115\ m^2K/W$$

11/18/92

Total resistance of *construction* = R outer leaf + R inner leaf
= 0.27 + 1.115
= 1.385 m²K/W

U-value of *construction* = $\dfrac{1}{\text{Total resistance}} = \dfrac{1}{1.385}$ = 0.72 W/m²K

So the *construction* of the *exposed* wall will satisfy the requirements of the Regulations.

APPENDIX 1

CALCULATION OF *U-VALUE* FOR A FLOOR

The *U-value* of a floor without insulation is derived from the following formula -

$$\frac{P(m)}{A(m^2)}$$

where

P = the perimeter of the floor in metres measured along the internal faces of the external walls of the *building* excluding unheated spaces outside the insulated fabric such as a *porch* or attached garage but including the lengths of wall separating the heated from the unheated spaces; and

A = the area of the floor in square metres measured between the internal faces of the *external walls* of the *building* excluding unheated spaces outside the insulated fabric such as a porch or attached garage.

The formula applies to all floors next to the ground including slab-on ground, concrete raft, suspended timber and suspended beam-and-block.

For *buildings* consisting of a number of *dwellings* such as a terrace or block of flats, the dimensions are those for the area under the whole *building*.

Table 1 gives *U-values* for uninsulated floors next to the ground and Table 2 gives insulation thicknesses in mm required to achieve 0.45 for a floor.

Table 1: *U-values* of uninsulated floors

$\frac{P(m)}{A(m^2)}$	***U-value*** **(W/m²K)**
0.1	0.21
0.2	0.36
0.3	0.49
0.4	0.61
0.5	0.73
0.6	0.82
0.7	0.91
0.8	0.99
0.9	1.05
1.0	1.10

Note 1:

Linear interpretation can be used for intermediate values of P/A.

Part J

Appendix 2

CALCULATION OF *U-VALUES* FOR A FLOOR

Table 1: Insulation thicknesses (mm) to achieve 0.45 W/m²K

P(m) / A(m²)	Thermal conductivity of insulation W/(mK) 0.025	0.03	0.035	0.04	0.045	0.05
0.27 or less	0	0	0	0	0	0
0.3	5	6	6	7	8	9
0.4	15	18	21	24	27	30
0.5	21	25	29	34	38	42
0.6	25	30	35	40	45	50
0.7	28	34	39	45	51	56
0.8	30	36	42	48	54	60
0.9	32	38	44	51	57	63
1.0	33	39	46	53	59	66

Note 1:

Linear interpretation can be used for intermediate values of P/A and intermediate values of thicknesses of insulation for intermediate insulation values.

Example 1: Rectangular *building*

$P = 10 + 5 + 10 + 5 = 30m$
$A = 10 \times 5 = 50m^2$
$P/A = 0.6m^{-1}$
from Table 1, $U = 0.82\ W/m^2K$

Example 2: L-shaped *building*

$P = 10 + 9 + 4 + 3 + 6 + 6 = 38m$
$A = (10 \times 6) + (4 \times 3) = 72m^2$
$P/A = 0.528m^{-1}$

by interpolation from Table 1,
$U = 0.76\ W/m^2K$

Although larger floors do not need insulation to achieve the required *U-value*, edge insulation may be necessary to avoid creating a thermal bridge. It will also be necessary to ensure that thermal bridging does not occur between insulated floor and wall.

Part J

Appendix 3

CALCULATION TO DETERMINE THE PERMISSIBLE AREA OF WINDOWS, DOORS AND ROOFLIGHTS IN THE ELEMENTAL APPROACH (METHOD 1)

1. A proposed *dwelling* has a total floor area of 80m². It has 2 half-single-glazed doors and double-glazed windows as described in Table 1.

Table 1: Window and door openings for a proposed *dwelling*

Element	**Area (m²)**	**U-value (W/m²K)**	**Rate of heat loss per degree (W/K)**
Windows	12.2	3.0	36.6
2 Doors	3.8	3.7	14.06
Totals	16		50.66

2. The Average *U-value* for windows and doors is given by the ratio:-

$$\frac{\text{(Total rate of heat loss per degree)}}{\text{(Total area of window and door openings)}}$$

From the table this ratio is $\frac{50.66}{16}$ = **3.2 Wm²K**

3. The total area of openings is

$$\frac{16}{80} = 20\% \text{ of the floor area}$$

4. It can be seen from Table 3 to J2.4 that the permitted area of windows, doors and rooflights for a *U-value* of 3.2 W/m²K is 21%. The proposed design therefore satisfies the requirements.

Part J

Appendix 4

THE *BUILDING* FABRIC TARGET APPROACH (METHOD 2)

A detached *dwelling*

1. Consider the example in Figure 1 which has details as given in Table 1. It is proposed to adopt the Fabric Target approach with *U-values* for the walls, floor and roof a little higher (worse) than would otherwise be required in the Elemental Approach. The floor slab is nevertheless to be provided with some insulation, the cavity walls are to have dry-linings and the windows and doors are to have metal frames with thermal breaks and sealed double-glazing.

The Target

2. From Technical Standard J2 8 the Target *U-value* for a *dwelling* is given by:-

$$\frac{\text{(Total floor area)} \times 0.57}{\text{(Total exposed surface area)}} + 0.4$$

In this case therefore the target *U-value* is:-

$$\frac{112.8 \times 0.57}{267.8} + 0.4 = \mathbf{0.64\ W/m^2K}$$

The Average *U-value*

3. The average *U-value* for the *dwelling* is given by the ratio of the 2 values.-

$$\frac{\text{(Total rate of heat loss per degree)}}{\text{(Total external surface area)}}$$

These values are calculated as shown in Table 1 and for the example therefore:-

$$U_{AV} = \frac{192.04}{267.8} = \mathbf{0.72\ W/m^2K}$$

4. The proposed design does not meet the requirements and modifications must be explored. Possibilities include improving the thermal resistance of the *exposed* walls and the windows and doors and taking account of the benefits of solar gain and more efficient space heating systems. For illustration purposes they are all considered as follows.

Taking account of solar gain

5. The total window and door area in the example is 25.8m^2 of which 8.65m^2 faces north ± 30° and 13.8m^2 faces south ± 30°. The area of window and hence the total area used in the calculation of the average *u-value* can be reduced by 20% of (13.8 - 8.65) = 1.03m^2.

APPENDIX 4

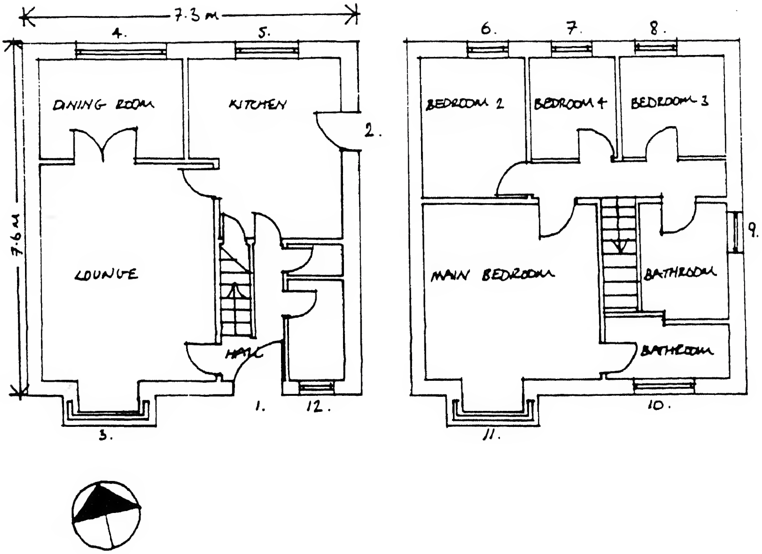


Figure 1

Table 1: Data for the detached *dwelling*

Exposed element	*Exposed* surface area (m^2)	*U-value* (W/m^{2}K)	Rate of heat loss per degree (Area x *U-value*) (W/K)
Floor	56.4	0.45*	25.38
Windows	22.0	3.3*	72.6
Doors	3.8	3.3*	12.54
Walls	129.2	0.5*	64.6
Roof	56.4	0.3*	16.92
Totals	267.8		192.04

Note The *U-values* are calculated using the proportional area method.

Improving the thermal resistance of the windows

6 Table 2 to J2.4 gives indicative figures for *U-values* of various types of windows and doors although manufacturers' information should be used in preference if available. For the purposes of this example it is proposed to alter the window and door specifications to obtain *U-values* of 2.9 W/m^{2}K and 3.0 W/m^{2}K respectively.

Improving the thermal resistance of the walls

7. Section B of the dts for J2.3 on page 27J et seq indicates how the Tables in Section A of the dts can be used to develop wall designs to achieve given *U-values*. For the purposes of this exercise it is proposed to alter the wall specification to obtain a *U-value* of 0.45 W/m²K.

Determination of the revised average *U-value*

8. The revised average *U-value* is calculated in the same way as before. The revised table of data follows with the alterations highlighted.

Table 2: Revised data for the detached *dwelling*

Exposed element	*Exposed* surface area (m²)	*U-value* (W/m²K)	Rate of heat loss per degree (Area x *U-value*) (W/K)
Floor	56.4	0.45*	25.38
Windows	20.97	2.9*	60.81
Doors	3.8	3.0*	11.4
Walls	129.2	0.45*	58.14
Roof	56.4	0.3*	16.92
Totals	266.77		172.65

Note: The *U-values* are calculated using the proportional area method.

For the revised proposals therefore:-

$$U_{AV} = \frac{172.65}{266.77} = \mathbf{0.65\ W/m^2K}$$

This is still higher than the target of 0.64 W/m²K set in paragraph 2 so further alteration of the fabric element specifications will be necessary to achieve compliance. (Reducing either the floor or the roof *U-value* would be sufficient or alternatively consideration could be given to performance heating system as follows.

Selecting a higher performance heating system

9 In accordance with J2.8 a hot water central heating system incorporating a condensing boiler could be specified in return for relaxing the target *U-value* by 5%. The target in this case could therefore be increased from 0.64 W/m²K to 0.67 W/m²K.

Compliance

10. The detached *dwelling* as described in Figure 1 and Table 1 can be made to comply with the requirements by taking solar gain into account and

EITHER increasing the performance of the windows, doors, walls and either the roof or the floor,

OR increasing the performance of the windows and installing a hot water central heating system incorporating a condensing boiler.

Part J

Appendix 5

THE ENERGY USE APPROACH (METHOD 3)

1. BRE Report 150 (1989) entitled "Building Regulations: Conservation of fuel and power - the 'energy target' method of compliance for *dwellings*" was quoted in the Technical Standards as being an acceptable method of demonstrating compliance with the requirements. A similar report is to be published relating to the Energy Use approach and will take into account the improved standards and the different method of calculating *U-values*.

2. It is proposed to give encouragement to this more sophisticated approach by reproducing the worksheets as part of this Appendix. The current (1989) version of the BREDEM Worksheet follows by way of example but the revised version will be incorporated in the final document.

BREDEM WORKSHEET (Version-BREDEM-9.2)

To be used with BRE Report BR150 'Building Regulations : conservation of fuel and power — the 'energy target' method of compliance for dwellings'.

Part A *Calculation for the intended construction*

1 Overall house dimensions

Ground floor area (m^2) = (1a)
First floor area (m^2) = (2a)
Second and other floors (m^2) = (3a)
Total floor area = (4a)
Average storey height (m) = (5a)
House volume (4a) × (5a) = (6a)

2 Air-change rate

Air fixed rate (air changes per hour) (fixed value) = 1.0 (7a)

3 Heat loss

Element		Gross Area (m^2)	Glazed openings (m^2)	Net Area (A) (W/m^2K)	U-value (W/K)	A x U (W/K)
Glazed openings (single glazed)	– elevation 1 =	(8a)			× 5.7	= (19a)
	– elevation 2 =	(9a)			× 5.7	= (20a)
	– elevation 3 =	(10a)			× 5.7	= (21a)
	– elevation 4 =	(11a)			× 5.7	= (22a)
	– roof =	(12a)			× 5.7	= (23a)
Glazed openings (multiple glazed) (U = 2.8 or 2.0)	– elevation 1 =	(13a)			×	= (24a)
	– elevation 2 =	(14a)			×	= (25a)
	– elevation 3 =	(15a)			×	= (26a)
	– elevation 4 =	(16a)			×	= (27a)
	– roof =	(17a)			×	= (28a)
Total glazed opening area:	=	(18a)	(Carry 18a to 18b)			
Floors	Ground	(1a)			×	= (29a)
	Exposed				×	= (30a)
Walls	Exposed — type 1 =		–	* =	×	= (31a)
	— type 2 =		–	* =	×	= (32a)
	Semi-exposed =				×	= (33a)
Roofs	Exposed — type 1 =		–	* =	×	= (34a)
	— type 2 =		–	* =	×	= (35a)

**The sum of the values in these four boxes must equal the value in Box 18a.*

Total fabric loss: = (19a) + (20a) + ... (35a) = (36a)

Ventilation loss: = (6a) × 0.33 × 1.0 (7a) = (37a)

Total specific heat loss (W/K): = (36a) + (37a) = (38a)

The Heat Loss Parameter is the specific heat loss divided by the floor area:

Heat Loss Parameter (HLP): = (38a) ÷ (4a) = (39a)

4 The Mean Internal Temperature

Use the Heat Loss Parameter (HLP) of Box 39a in Table 1 to obtain the mean temperature of the living area, and the temperature difference between living area and the rest of the house.

Mean temperature of living area = ______ (40a)
Temperature difference = ______ (41a)

Enter the fraction of the total internal floor area assigned to living areas (including any lounge, living room, sitting room or dining room):

Living area fraction (0.0 to 1.0): = ______ (42a)
Rest of house fractional area: = 1.0 − (42a) = ______ (43a)
Mean internal temperature: = (40a) − ((41a) × (43a)) = ______ (44a)

5 Internal gains

Use the total floor area in Box 4a to obtain a value for the internal heat gains from Table 2.

Internal gains (from Table 2) = ______ (45a)

Solar gains

Enter the area (m²) of the whole glazing including frame and the value for solar flux for single and/or multiple glazing from Table 3. See note to Table 3 concerning orientations.

			Area (m²)		Solar Flux (W/m²)		Gains (W)	
Glazed openings (single glazed)	− Northerly	=		×	10.0	=		(46a)
	− Easterly	=		×	18.1	=		(47a)
	− Southerly	=		×	30.4	=		(48a)
	− Westerly	=		×	18.1	=		(49a)
	− Rooflights	=		×	31.0	=		(50a)
Glazed openings (Multiple glazed)	− Northerly	=		×		=		(51a)
	− Easterly	=		×		=		(52a)
	− Southerly	=		×		=		(53a)
	− Westerly	=		×		=		(54a)
	− Rooflights	=		×		=		(55a)

Total solar gain = (46a) + (47a) + … + (55a) = ______ (56a)
Total gains = ______ (45a) + ______ (56a) = ______ (57a)
Gain/Load ratio (G/L) = ______ (57a) ÷ ______ (38a) = ______ (58a)

Useful gains: *Get utilisation factor from Table 4 using Box 58a for value of G/L*

Useful gains = (Utilisation factor) ______ × ______ (57a) = ______ (59a)

6 Degree-days

Use the useful gains in Box 59a and the specific heat loss in Box 38a to calculate the temperature rise due to the internal and solar gains. Subtract this from the mean internal temperature to obtain the base temperature.

Temperature rise from gains = ______ (59a) ÷ ______ (38a) = ______ (60a)
Base temperature = ______ (44a) − ______ (60a) = ______ (61a)

Use Table 5 to obtain the degree-days from the base temperature:

Degree-days (use Box 61a in Table 5) ______ (62a)

7 Net space heating energy requirement

Calculate the net space heating energy requirement (GJ/annum) from the specific loss Box 38a and the degree-days Box 61a. Express the result to one place of decimals.

Space heating 0.0000864 × ______ (38a) × ______ (62a) = ______ (63a)

Further copies of this worksheet are available in packages of 50 copies, price £5.00 (post free). Ref AP47 from Publication Sales, Building Research Establishment, Garston, Watford WD2 7JR. Write cheques payable to DOE/Building Research Establishment.

Part B *Calculation for notional building (with prescribed U-values etc)*

1 Overall house dimensions

Total floor area = (4a) = (4b)
House volume = (6a) = (6b)

2 Air change rate

Air change rate (air changes per hour) (fixed value) = 1.0 (7b)

3 Heat loss

Total glazed opening area in actual design = (18a) = (18b)
15% of floor area: = 0.15 x (4b) = (19b)
Enter the smaller of Boxes 18b and 19b: = (20b)

U-value of floor without insulation: = (21b)
Enter the smaller of 0.45 and Box 21b = (22b)

Element		Gross Area (m^2)	Glazed openings (m^2)	Net Area (A) (N^2)	U-value (W/m^2K)	A × U (W/K)
Glazed openings		= (20b)			× 5.7	= (28b)
Floors	Ground	=			× (22b)	= (29b)
	Exposed	=			× 0.45	= (30b)
Walls	Exposed	=	− (20b)	=	× 0.45	= (31b)
	Semi-exposed	=			× 0.6	= (33b)
Roofs	Exposed	=			× 0.25	= (34b)

Total fabric loss: (28b) + (29b) + (30b) + (31b) + (33b) + (34b) = (36a)

Ventilation loss: = (6b) × 0.33 × 1.0 (7b) = (37b)

Total specific heat loss (W/K): (36b) + (37b) = (38b)

Heat Loss Parameter (HLP): = (38b) ÷ (4b) = (39b)

4 Mean internal temperature

Use the Heat Loss Parameter (HLP) of Box 39b in Table 1 to obtain the mean temperature of the living area, and the temperature difference between living area and the rest of the house.

Mean temperature of living area (Table 1) = (40b)
Temperature difference (Table 1) = (41b)

Living area fraction = (42a) = (42b)
Rest of house fractional area = 1.0 − (42b) = (43b)
Mean internal temperature = (40b) − ((41b) × (43b)) = (44b)

5 Internal and solar gains

Internal gains, same value as Box 45a: ______ (45b

Solar gains = ______ (20b) × 18.1 = ______ (56b

Total gains = ______ (45b) + ______ (56b) = ______ (57b

Gain/load ratio (G/L) = ______ (57b) – ______ (38b) = ______ (58b

Get utilisation factor from Table 4 using Box(58b) for value of (G/L)

Useful gains = (utilisation factor) ______ × ______ (57b) = ______ (59b

6 Degree-days

temperature rise from gains = ______ (59b) ÷ ______ (38b) = ______ (60b

Base temperature = ______ (44b) – ______ (60b) = ______ (61b

Degree-days (use Box 61b in Table 5) = ______ (62b

7 Net space heating energy requirement

Space heating = 0.0000864 × ______ (38b) × ______ (62b) = ______ (63b

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Further copies of this worksheet are available in packages of 50 copies, price £5.00 (post free). Ref AP47 from Publication Sales, Building Research Establishment, Garston, Watford WD2 7JR. Write cheques payable to DOE/Building Research Establishment.

Part J

Appendix 6

THE STANDARD ASSESSMENT PROCEDURE FOR ENERGY RATING OF *DWELLINGS*

TECHNICAL PRINCIPLES

1. The Standard Assessment Procedure (SAP) is the Government's procedure whereby home energy ratings can be compared. It provides a measure of the energy performance of a *dwelling* and its heating system.

2 The SAP is based on the cost of energy required for space and water heating (in a typical year and under typical occupancy conditions), normalised in such a way as to make the SAP rating approximately independent of the size of the *dwelling*. It takes into account the following factors and parameters:

   a) thermal insulation standards for the roof, ground floor and walls, including windows and doors,

   b) built form,

   c) ventilation and infiltration characteristics,

   d) the performance of water and space heating systems,

   e) solar gains,

   f) heating controls,

   g) energy costs, including standing charges.

   The assessment is based on an assumed pattern of heating, demand for hot water and internal gains, for example arising from the use of lights and appliances. The SAP is independent of regional location.

3. SAP ratings are expressed as a number on a scale of 1-100 with 1 indicating a poor performance and 100 a good one. The higher the SAP rating, the lower the likely cost of energy used per unit floor area.

4. The SAP has been developed in the form of a worksheet with accompanying tables of input data on energy costs, *U-values* etc. Other variables, such as floor area and window area, etc are included on the assessment form. The method of obtaining this latter information forms part of the SAP procedure.

5. The SAP, the accompanying input tables, and the methods whereby the above variables are measured or otherwise obtained will be reviewed annually and any revisions deemed necessary will be incorporated accordingly.

APPENDIX 6

6 Organisations wishing to become authorised to issue the Government's Standard Assessment Procedure (SAP) will be required to meet the following conditions -

a) The SAP will be made available in the form of a worksheet. If the organisation or individual wishes to convert the worksheet to a computer program, this program must first be submitted to the Building Research Establishment for confirmation that it correctly incorporates the SAP

b) The systems and procedures for issuing SAP ratings must achieve the BS 5750 standard of quality assurance (to a quality standard set by the Government)

c) The organisation or individual agrees to display the SAP rating on their label with specified wording provided by the Government.

d. The organisation or individual agrees to provide certain statistical data to Government on the SAP ratings issued.

APPENDIX 2

BUILDING REGULATIONS PROPOSED REVISION OF PART K

VENTILATION OF BUILDINGS

BUILDING REGULATIONS PROPOSED REVISION OF PART K
VENTILATION OF BUILDINGS
OUTLINE OF THE PROPOSALS

1. The following paper outlines the main changes proposed to Regulation 23 and Part K of the Technical Standards.

PROVISIONS FOR DWELLINGS

2. The existing requirements which deal with ventilation on a room by room basis would be replaced by functional statements supported by deemed-to-satisfy specifications based on ventilation of the whole dwelling. The deemed-to-satisfy specifications provide for ventilation of a dwelling by wholly natural means, or by wholly mechanical means or by a combination of both. This provides the opportunity to place more precise restrictions on the use of open flue appliances. The ventilation requirements have, in some cases, been amended most notably by the addition of passive stack ventilation as an option and the increase from $4000mm^2$ to $6000mm^2$ of trickle ventilation to provide a greater potential for background ventilation if required as houses are built to the more tightly sealed standards of the revised Part J.

PROVISIONS FOR BUILDINGS OTHER THAN DWELLINGS

3. For buildings other than dwellings it is proposed to relate the requirements more closely to the domestic, or otherwise, nature of the space being ventilated. This is the underlying principle of the existing standards, the revision merely tries to make this clearer. For buildings other than those with domestic type spaces the sources for appropriate guidance have been revised.

VENTILATION OPENINGS INTO COURTYARDS

4. It is proposed to discontinue the existing requirements on ventilation openings into courtyards as the efficacy of the present arrangements is questionable and it is difficult to derive verifiably accurate standards to cover all possible circumstances.

MECHANICAL VENTILATION

5. It is proposed to require evidence of commissioning and testing of mechanical or air conditioning systems in buildings.

VENTILATION OF GARAGES

6. No changes are recommended for these requirements.

BUILDING REGULATIONS PROPOSED REVISION OF PART K

VENTILATION OF BUILDINGS

COST COMMENT

1. The proposal is to revise the existing requirements of the Building Standards (Scotland) Regulations 1990 for the ventilation of buildings (Part K). The requirements of the Building Regulations apply when building work is undertaken. Provisions for ventilation are already included in the requirements but this revision has been brought about by the revision of the requirements for conservation of fuel and power (Part J) as both of these Parts interact.

Proposed changes

2. The main changes include:

   a. the introduction of passive stack ventilation as an alternative to mechanical extract in dwellings or similar spaces;

   b. a re-organisation of the requirements to attempt to preclude a potentially lethal combination of extract fan and open flued appliance;

   c. increased potential for trickle ventilation;

   d. the removal of special requirements for ventilation openings into courtyards;

   e. a requirement for air conditioning and mechanical systems to have evidence of commissioning and testing; and

   f. options to provide a greater range of ventilation possibilities for a building.

Purpose of the regulations

3. To ensure that there are available adequate means of ventilation which, if used, will provide an adequate supply of air for human occupation and restrict the possible accumulation of condensation which could lead to unsatisfactory living conditions.

Business sectors affected

4. The proposed changes will affect developers, building professionals, builders, sub-contractors, building product manufacturers and those commissioning building work.

5. It is estimated that the additional building costs resulting from the improved standards will be:

   a. for an average new semi-detached house the improved arrangements for trickle ventilation will cost approximately £75. Passive stack ventilation is estimated to be of a similar order of cost as the existing requirements for mechanical extract; and

b. no extra costs are expected for non-domestic buildings as the proposals generally reflect what would be expected for compliance with the "Workplace Health, Safety and Welfare Regulations 1992".

6. It is estimated that the total additional building costs for the house building industry as a whole would be in the order of £15m per year.

Effects on international competitiveness

7. The proposals should not place UK companies at a disadvantage.

Extent of consultation

8. These proposals will be subject to wide consultation with various interests including materials producers, the construction professionals, the CBI, the National Chamber of Trade, house building and consumer interests etc.

Alternative approaches

9. Concern about indoor air quality and condensation in dwellings suggests that this is an important issue which should continue to be addressed in Building Regulations as are the requirements for buildings other than those which are purely domestic in character.

Env-BD/B
August 1993

PART K

VENTILATION OF BUILDINGS

Contents

Introduction

Regulation 23

Ventilation of a building

The standards

K1	Application of Part K	K1.1-K1.9
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	Mechanical ventilation	K2.3-K2.6
K3	Garages	
	Small garages	K3.1-K3.2
	Large garages	K3.3

Provisions deemed to satisfy the standards

(K1.4) Application of Park K
(K2.1) Ventilation of a building
(K2.6) Mechanical ventilation
(K3.3) Large garages

Asterisks

Throughout the Technical Standards an asterisk against a standard denotes that a provision deemed to satisfy the standard or some aspect of the standard is specified at the end of the relevant Part.

Italics

Throughout the Technical Standards a term in italics is a defined term. The definition is listed in Part A, General.

PART K

INTRODUCTION

1. The intention of this Part is to ensure that an adequate supply of air is available for human occupation of a *building*.

2. The standards apply to all *buildings* covered by the Regulations but attention is particularly drawn to the requirements of the Workplace (Health, Safety and Welfare) Regulations 1992 and the supporting Approved Code of Practice which, in relevant situations, may also have to be taken in account.

3. There are 2 underlying approaches to ventilating a *building*. The first is a set of mainly empirical standards which may be used for a *dwelling* or domestic type space in a *building*. The second is where more sophisticated *buildings*, larger spaces or novel solutions are proposed and involve the use of more theoretical techniques.

Part K
Regulation 23

Ventilation of a *building*

23 (1) Every *building* shall have means of providing an adequate supply of air for users of the *building*.

(2) An opening in a *building* which is required for the purposes of paragraph (1) shall be so located as to ensure effective operation.

(3) Paragraph (2) shall not be subject to specification in a notice served under section 11 of the Act.

Part K
The standards

K1 Application of Part K

K1.1 This Part sets out the required standards for regulation 23.

K1.2 This Part applies to all *buildings*.

K1.3 A space in a *building* containing an open *flued* appliance must not have an extract fan in the same space.

K1.4* Where a *dwelling* contains an open *flued* appliance it must -

a. be naturally ventilated in accordance with K2.1a.; or

b. have a combined natural and mechanical system in accordance with K2.1c. and have a spillage test carried out on completion of the installation.

K1.5 The volume of any space for ventilation purposes is the internal cubic capacity of the space, **except** -

a. where the space is for vehicle parking any volume over 3m above floor level is to be disregarded; and

b. in any other space any volume over 6m above floor level is to be disregarded

(Where the space contains more than one floor the exceptions apply to the highest floor.)

K1.6 Any requirement for an area of opening may be met by a combination of areas.

K1.7 All requirements (eg sizes of ventilators, fan capacities) are minimum requirements unless otherwise stated.

K1.8 Part E requires ventilation openings in escape routes. Where these would meet the requirements of this Part the provision need not be duplicated.

K1.9 Part F requires ventilation openings for combustion. These are in addition to, and must be kept separate from, any openings required by this Part.

K2 *Buildings* other than garages

VENTILATION OF A *BUILDING*

K2.1* A *building* other than a garage ventilated in accordance with K3 must have adequate provision for -

a. natural ventilation; or

b. mechanical ventilation; or

c. a combination of natural and mechanical ventilation.

NATURAL VENTILATION

K2.2 Ventilation must be to the outside air,
except -

a *ventilator* serving a room in a *dwelling* may open into a *conservatory* provided that the *conservatory* is ventilated direct to the outside air by both -

a. a *ventilator* with an open area of 1/30th of the combined floor area of the room plus the *conservatory*, and

b. a *trickle ventilator* with an open area of 6,000mm^2.

MECHANICAL VENTILATION

K2.3 Where a mechanical system serves more than one *dwelling* it must have a duplicate motor and be separate from any other ventilating plant.

K2.4 Mechanical ventilation must be to the outside air. It may be via a duct or heat exchanger.

K2.5 An inlet for mechanical ventilation must be positioned in relation to any outlet for smoke, steam or noxious vapours so as to avoid contamination of the air supply.

K2.6* A mechanical ventilation or air conditioning system in a building must be commissioned and tested to demonstrate that the installation can operate effectively

K3 Garages

SMALL GARAGES

K3.1 A garage with a floor area of 30m² to 60m² used for parking motor vehicles must have adequate provision for natural or mechanical ventilation.

For natural ventilation provide 2 *permanent ventilators*, each with an open area of 1/3,000th of the floor area, positioned to encourage through ventilation, with one of the *permanent ventilators* being not more than 600mm above floor level.

For mechanical ventilation provide a system capable of continuous operation, designed to give an extraction rate of 2 air changes per hour.

K3.2 A mechanical system complying with K3.1 must be -

a. independent of any other ventilating plant; and

b. *constructed* so that two-thirds of the exhaust air is extracted from outlets not more than 600mm above floor level.

LARGE GARAGES

K3.3* A garage with a floor area greater than 60m² must have adequate provision for natural or mechanical ventilation on every *storey*.

Part K
Provisions deemed to satisfy the standards

APPLICATION OF PART K

(K4.1) The requirements of K1.4b. will be met by evidence of a satisfactory spillage test carried out in accordance with BS 5440: Part 1: 1990, Clause 4.3.2.3 on completion of the installation.

VENTILATION OF A *BUILDING*

(K2.1) Where the *building* is a *dwelling*, or the spaces to be ventilated in the *building* are similar in size and function to a *dwelling* (eg hotel bedrooms, small kitchens) the requirements of K2.1 will be met by:

a. for K2.1a., natural ventilation provided in accordance with tables 1 and 2 and diagram 1 to this specification;

b. for K2.1b., a balanced (supply and extract) system *constructed* in accordance with Building Research Information Paper IP 18/88; and

c. for K2.1c., combined natural and mechanical ventilation provided in accordance with table 3 to this specification.

Where the *building* is not a *dwelling*, or the spaces to be ventilated in the *building* are not similar in size and function to a *dwelling* (eg open plan offices, departmental stores) the requirements of K2.1 will be met by ventilation constructed in accordance with the relevant sections of BS 5925: 1991, BS 5720: 1979, BS 5250 and CIBSE Design Guides Volumes A and B.

Table 1 to dts (K2.1): Natural ventilation

a *room* with a floor area of more than 4m^2	a. a *ventilator* with an open area of 1/30th of the floor area; and b. a *trickle ventilator* with an open area of 6,000mm^2
a utility *room*, a *kitchen* and any space containing a bath and/or shower, with or without a wc	a. a *ventilator* with an open area of 1/30th of the floor area; b. a *trickle ventilator* of 6,000mm^2; and c. a passive stack ventilator in accordance with table 2 to this specification
a *watercloset compartment*	a. a *ventilator* with an open area of 1/30th of the floor area; or b. a passive stack ventilator in accordance with table 2 to this specification

Table 2 to dts (K2.1): Passive stack ventilation

	Diameter of *duct* in mm [Note 1]			
	straight		with offset [Note 2]	
Space	100	125	125	150
a *kitchen* or utility *room*		X		
a space containing a bath and/or shower, with or without a wc		X		X
a *watercloset compartment*	X		X	

Notes:

1. Non-circular *ducts* of equivalent cross sectional area may be used.
2. An offset must not have more than 2 bands each with an angle of not more than 45° to the vertical.

Table 3 to dts (K2.1): Natural and mechanical ventilation

a *room* with a floor area of more than 4m²	a. a *ventilator* with an open area of 1/30th of the floor area; and b. a *trickle ventilator* with an open area of 6,000mm²
a *kitchen*	a. i. a fan capable of extracting at a rate of 60 litres/sec; or ii. a cooker hood capable of extracting at a rate of 30 litres/sec; and b. i. a *trickle ventilator* with an open area of 6,000mm²; or ii. a fan in an accordance with a.i. which is also capable of extracting continuously at a rate of 6 litres/sec
a utility room	a. a fan capable of extracting at a rate of 30 litres/sec; and b. i. a *trickle ventilator* with an open area of 6,000mm²; or ii. the fan must be capable of extracting continuously at a rate of 6 litres/sec
a space containing a bath and/or shower, with or without a wc	a. a fan capable of extracting at a rate of 15 litres/sec; and b. i. a *trickle ventilator* with an open area of 6,000mm²; or ii. the fan must be capable of extracting continuously at a rate of 6 litres/sec
a *watercloset compartment*	a. a *ventilator* with an open area of 1/30th of the floor area; or b. a fan capable of extracting at a rate of 6 litres/sec

(K2.6, K3.3)

MECHANICAL VENTILATION

(K2.6) The requirements of K2.6 will be met where an installation complies with the relevant requirements for commissioning and testing given in the CIBSE Commissioning Codes.

LARGE GARAGES

(K3.3) The requirements of K3.3 will be met by a garage constructed in accordance with:

a. the Association of Petroleum and Explosive Administration: "Code of Practice for ground floor, multi-storey and underground parks"; and

b. CIBSE Guide B2.

APPENDIX 3

THE USE OF AIR CONDITIONING AND MECHANICAL VENTILATION IN NON-DOMESTIC BUILDINGS

Draft for consultation

26/1/93

THE USE OF AIR CONDITIONING AND MECHANICAL VENTILATION IN NON-DOMESTIC BUILDINGS

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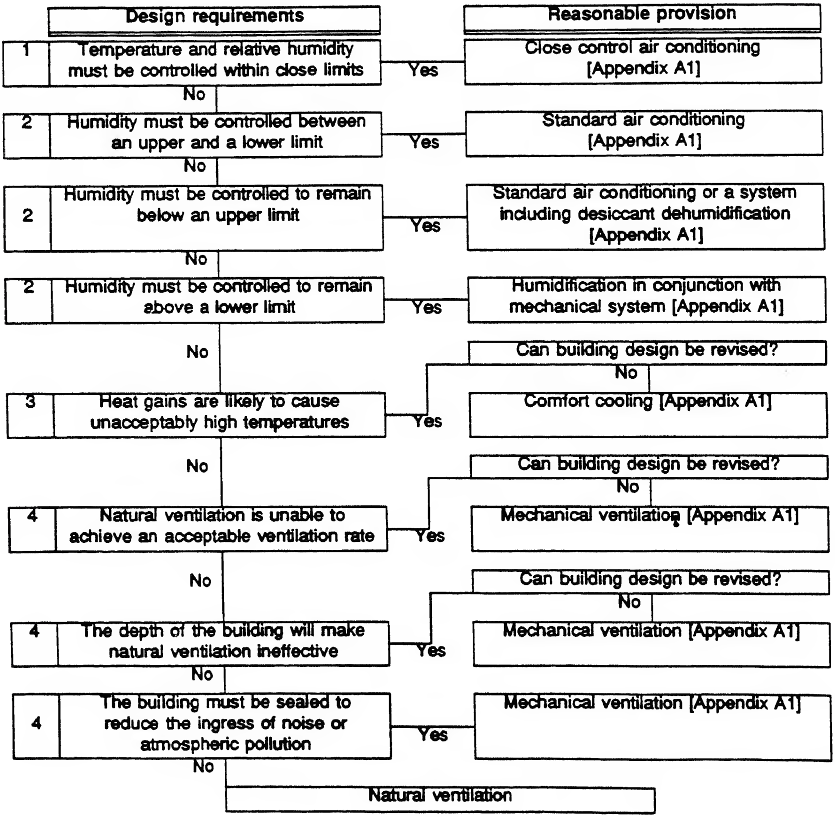
1. Guidelines for assessing the need for air conditioning and mechanical ventilation

The following flowchart can be used to assess whether a proposed air conditioning or mechanical ventilation system makes reasonable provision for the conservation of fuel and power in accordance the requirements of the building regulations . In using the decision flowchart consideration should be given to the guidance contained in the following sections which are numbered to correspond with the decision boxes.


Design requirements
Reasonable provision
1 Temperature and relative humidity must be controlled within close limits
Yes
Close control air conditioning [Appendix A1]
No
2 Humidity must be controlled between an upper and a lower limit
Yes
Standard air conditioning [Appendix A1]
No
2 Humidity must be controlled to remain below an upper limit
Yes
Standard air conditioning or a system including desiccant dehumidification [Appendix A1]
No
2 Humidity must be controlled to remain above a lower limit
Yes
Humidification in conjunction with mechanical system [Appendix A1]
No
Can building design be revised?
No
3 Heat gains are likely to cause unacceptably high temperatures
Yes
Comfort cooling [Appendix A1]
No
Can building design be revised?
No
4 Natural ventilation is unable to achieve an acceptable ventilation rate
Yes
Mechanical ventilation [Appendix A1]
No
Can building design be revised?
No
4 The depth of the building will make natural ventilation ineffective
Yes
Mechanical ventilation [Appendix A1]
No
4 The building must be sealed to reduce the ingress of noise or atmospheric pollution
Yes
Mechanical ventilation [Appendix A1]
No
Natural ventilation

Space heating is ignored for the purposes of this decision flowchart, although normally it will be provided as part of the air conditioning or mechanical ventilation systems.

Any proposed air conditioning or mechanical ventilation system should be capable of being controlled effectively. Guidance on achieving effective control is given in the CIBSE Application Manual AM1[1].

The design of air conditioning or mechanical ventilation systems should include provision to allow them to be effectively commissioned. Commissioning in accordance with the relevant recommendations in the CIBSE Commissioning Codes[2] would be appropriate.

DESIGN REQUIREMENTS

Basis of decision:

1. Close control of temperature and humidity

Close control will be necessary only if an activity or process is to be carried out which could not be performed, or would not function, if temperature and humidity are not controlled within closely defined tolerances. Examples where close control will be indicated include:

- Purpose built, dedicated, computer suites where temperatures and humidities must be maintained within the tolerances specified by the computer manufacturer.
- Building compartments designed for the storage of specimens, exhibits, or goods whose physical preservation depends on temperatures and humidities being maintained within particular tolerances.
- Building compartments in which there is a manufacturing or other process whose success depends on temperatures and humidities being maintained within particular tolerances.
- Medical suites such as Intensive Care Units and operating theatre suites.

Close control of temperature and humidity is unnecessary for the comfort of human occupants of a building.

The provision of close control of temperature and humidity should be restricted to those areas of buildings where it is necessary.

2. Humidity control

Humidity control may be required:

- To ensure that a minimum humidity level is maintained for human occupant comfort, for example when the requirement to heat incoming fresh air during winter would reduce humidity levels below about 40%RH. At humidities below this level there is a likelihood of occupants experiencing electrostatic shocks from build-up of static electricity [3].

  Minimum level humidity control causes a need for humidification, not necessarily the provision of air conditioning. Humidification can be provided in addition to comfort cooling, natural and mechanical ventilation systems. Some forms of humidification are associated with a risk to health, and due consideration should be given to guidance provided in the selection of suitable systems[4]. Alternatively, anti-static carpeting may be used to reduce the build-up of static charges in sensitive areas [3].

- To ensure that unacceptably high levels of humidity are not experienced in the building, which may cause uncomfortable conditions for occupants or which may give rise to condensation within the building. CIBSE guidance specifies that relative humidities between 40% and 70% are generally acceptable for occupant comfort, with a preference for low humidity at high air temperatures [3]. Such conditions usually accommodate most health requirements and commercial and industrial processes. High humidity may result when there is a requirement to cool moist incoming fresh air during summer, or if large amounts of moisture are likely to be released inside the building.

  The requirement to reduce the moisture content of air involves both dehumidification and humidification, since most forms of humidity control require air to be dehumidified (by refrigeration) more than necessary and then re-humidified (and reheated) to the required supply condition. This function is normally carried out in buildings by an air conditioning system, although in some applications alternative methods of moisture removal using desiccants may be considered, particularly where unusually low humidity levels or temperatures are required.

The use of humidity control should be restricted to those areas of a building in which it is necessary. In the UK it is unlikely that summer dehumidification will be necessary unless there is a process or health requirement.

It is desirable to minimise the areas within a building where humidity is controlled because of the energy used in both humidification and dehumidification.

3. Preventing unacceptably high temperatures

Cooling should only be used to provide comfortable temperatures for building occupants where it has been assessed in accordance with Section A7 of the CIBSE Guide [3], or equivalent, that heat gains to rooms would give rise to unacceptable temperatures, and that these gains cannot be removed satisfactorily by natural or mechanical ventilation or by suitable redesign of the building.

- One of the common contributors to an expected need for cooling is the heat released by office equipment. In assessing expected heat gains Section A7 of the CIBSE Guide [3], or an equivalent method, should be used, but consideration should be given to recent work which indicates that these gains are often overestimated by the use of standard design values, resulting in the specification of unnecessary or over-large cooling plant which performs less efficiently as it is not fully loaded. Where possible the actual loads imposed by equipment should be more closely identified [5].

It is desirable to minimise the areas within a building in which cooling is used because of the energy used in providing cooling.

4. Ventilation

Mechanical ventilation to areas of a building should only be used where a required rate of ventilation and fresh air supply, assessed using Section A4 of the CIBSE Guide [3], or equivalent, cannot be met by natural ventilation. Current CIBSE guidance recommends a minimum ventilation rate of 8 litres/sec per person (in the absence of smoking) or (approximately) 2 litres/sec per m^2 of floor space (assuming minimum space per person as specified in the Offices, Shops and Railway Premises Act).

- Buildings subjected to excessive noise may need to be isolated by installing non-openable windows and forgoing the opportunity to ventilate the whole building naturally in order to achieve the design criteria for noise ratings, related to the activities carried out in the occupied spaces of the building, recommended in Section A1 of the CIBSE Guide [3], or equivalent. Particularly for areas and activities which may take place within office buildings, this guidance may be supplemented with the more comprehensive table of design targets provided in the book "Noise control in Building Services", from the Sound Research Laboratory [6]. However, the source of noise may be localised and sealed windows may not be required on all faces of the building, allowing parts of the building to retain the option of natural ventilation.

- Buildings subjected to excessive atmospheric pollution may also need to be sealed to prevent ventilation with air of poor quality. However, air conditioning may not be effective in improving air quality. The air filtration provided in mechanical ventilation or air conditioning systems is capable of removing particulate contamination only. The removal of gaseous contaminants requires highly specialised equipment not normally used in building applications because of the excessive operating costs and space requirements of the plant needed.

Preliminary BRE research shows that adequate ventilation may be provided through single-sided ventilation for offices as deep as 10m, rather than the 6m depth suggested in CIBSE guidance. This suggests that buildings 22m deep, with offices on either side of a 2m corridor, may meet requirements by natural ventilation [7].

Smoking zones will require increased fresh air supply, and a requirement of 30 litres/sec per person has been suggested [7]. This will require special provision.

It is desirable to minimise the areas within a building which are served by mechanical ventilation, because of the energy consumed by the fans in provide the required movement of air. Local extract systems can often be used to remove fumes, vapour and odours.

2. Guidelines for building refurbishment

Developers considering refurbishment of buildings need to address proposed changes in occupant requirements and will usually require changes to their design and construction. These changes may affect the requirements for ventilation and cooling and present opportunities to improve energy efficiency.

All refurbishment

Refurbishment presents an opportunity to assess and avoid those aspects of the design and construction which may promote excessive heat gains and which might impose an avoidable requirement for mechanical ventilation and cooling.

Refurbishment where air conditioning or mechanical ventilation was not previously installed

The full range of options from natural ventilation to the various forms of air conditioning should be considered, as in Section 1 above. Particular consideration should be given to options which preserve the ability to ventilate naturally when conditions allow, rather than to place full reliance on mechanical systems.

Refurbishment where air conditioning or mechanical ventilation was previously installed

Refurbishment provides an opportunity to reassess the provision of cooling and the suitability of the equipment installed to provide it. The option of providing the opportunity for natural means of ventilation should be considered as for new buildings.

REFERENCES

[1] **CIBSE Application Manual AM1**: Automatic controls and their implications for systems design. Chartered Institute of Building Services Engineers, London

[2] **CIBSE Commissioning Codes**. Chartered Institute of Building Services Engineers, London

[3] **CIBSE Guide, Volume A**, "Design Data". Chartered Institute of Building Services Engineers, London, 1986.

[4] **Sykes J**, "Precautions against illness associated with humidifiers", Health and Safety Executive, Specialist Inspectors Report No 11, Bootle, HSE, 1988.

[5] **BSRIA Technical Note TN 8/92**, "Power demands due to electronic office equipment".

[6] **Noise Control in Building Services**. Sound Research Laboratories, Edited by Alan Fry. Pergamon, 1988. (Chapter - Design Targets: Table - Subdivision of background Noise Criteria).

[7] **Draft - for discussion. "Ventilation in non-domestic buildings - revision of Building Regulations"**. E Perera (BRE), 17/2/92.

APPENDIX A1. Terminology

A1.1 Air conditioning functions

A number of mechanical systems are used to control internal air temperature and other parameters, notably humidity and cleanliness. Where refrigeration is included to provide cooling, the systems are commonly referred to as "air conditioning" although there are differences in the level of service that particular systems provide and in the energy these systems consume. For the purposes of this guidance air conditioning types are defined by reference to their purpose, as follows:

Mechanical ventilation

Mechanical ventilation systems contain no refrigeration plant, but use fans to supply outside air to meet ventilation and fresh air needs. Systems range in complexity and can include centralised systems which incorporate heat reclamation, air filtration, and extensive air distribution duct systems supplied by large air handling units. Naturally ventilated buildings in which ventilation to a small number of rooms is enhanced by individual wall or window mounted air extract fans are not normally considered to be mechanically ventilated.

Comfort cooling

Comfort cooling systems use refrigeration to reduce indoor temperature when required to produce more comfortable conditions for occupants. Ventilation and fresh air are not always supplied from a comfort cooling system, and may need to be provided separately. Comfort cooling systems range in complexity from individual, self-contained, wall or window mounted units (often called "air conditioners") to systems capable of providing cooling to a number of rooms or the whole building.

Standard air conditioning

The term "air conditioning" is commonly used to encompass any system where refrigeration is included to provide cooling. In this document the term is used to mean systems in which air is filtered, heated or cooled to the required supply temperature, and is humidified or dehumidified to maintain acceptable levels of relative humidity. Air conditioning systems supply all the ventilation and fresh air requirements of the internal spaces treated by the system.

Close control air conditioning

Close control air conditioning systems are similar to the systems described under the air conditioning system heading above, but are capable of maintaining temperature and relative humidity within close control limits, typically within 0.5°K and 5%RH, and are only specified when essential to the successful implementation of particular processes or activities. Maintaining these precise control limits usually involves higher capital costs and energy consumption compared with less precisely controlled systems.

A1.2 Building areas treated

Air conditioning or mechanical ventilation may be applied to sub-compartments within buildings in which there are particular overheating problems. A building which is naturally ventilated for most of the time may also include provision to operate comfort cooling or mechanical ventilation systems when internal temperatures are excessive or natural ventilation is inadequate. (It is important, however, that comfort cooling or air conditioning should not be used while a space is being naturally ventilated.) The following descriptions are used in this guidance document:

Full air conditioning systems

These are installed as the sole means of ventilation and supply conditioned air throughout all compartments of a building.

Partial air conditioning systems

These are installed as the sole means of ventilation and supply conditioned air only to particular sub-compartments of a building.

Mixed mode systems

These contain provisions for compartments to be naturally ventilated when outdoor air conditions are suitable, which can be replaced by air conditioning or comfort cooling if necessary.

Mechanical ventilation systems may similarly be described as full, partial or mixed.

APPENDIX A2. Background information on energy and the environment

A2.1 Energy issues

Buildings that contain air conditioning or mechanical ventilation systems normally consume considerably more energy than naturally ventilated buildings. As an example, a recent survey of the energy consumption of 400 office buildings for the Energy Efficiency Office showed that annual delivered energy consumption can range from under 100 to over 1000 kWh/m^2 of treated floor area. The energy consumed by naturally ventilated office buildings was typically 248 to 285 kWh/m^2, compared with 424 to 634 kWh/m^2 consumed by typical air conditioned office buildings, depending on building use and the levels of service provided [A1].

The energy used in the UK by air conditioning and mechanically ventilated systems in the commercial office sector has been rising at an increasing rate over recent years. It has been estimated by the Energy Efficiency Office [A2] that energy for refrigeration and air conditioning in the UK non-domestic, non-industrial sector was 3PJ in 1965, 7PJ in 1975 and 20PJ in 1985, with consumption expected to rise to 70PJ by the year 2000.

Some of the additional energy used will typically represent the energy consumed by office and other equipment, which may have given rise to the need for cooling in the first place. Where the building design does not allow sufficient daylight to penetrate inner areas, some additional energy use may stem from the need for additional artificial lighting. Heat released from artificial lighting also increases any need for cooling systems.

A large proportion of the additional energy is consumed by the fans and pumps required to distribute cool air and water throughout the building, and a smaller proportion by the refrigeration required to provide cooling [A1].

Air conditioning systems may include provision to add or remove moisture from the air to provide control of humidity levels. This normally imposes an additional load on the refrigeration plant used to remove moisture, and the means of supplying moisture (often a steam generator) also consumes additional energy.

Although inherently simpler in function, mechanical ventilation systems consume electrical energy to drive the fans which provide ventilation and fresh air. The air may be supplied through filters, heat exchangers and extensive duct systems. The electrical energy required to supply air through such systems may not be far removed from that of an equivalent air conditioning system.

In the interests of energy conservation the need to specify air conditioning or mechanical ventilation should be kept under continuous review. Where air conditioning or mechanical ventilation is required, it may not need to be installed to serve the entire building. There may also be circumstances where is becomes unnecessary to operate mechanical cooling systems for all of the time that cooling is needed.

The Good Practice Case Studies" published by the Energy Efficiency Office contain details of a number of new and refurbished buildings, including prestigious headquarters buildings, in which the need for air conditioning has been minimised or avoided [A3].

A2.2 The UK climate

The climate of the UK does not contain the long periods of high outdoor air temperature and humidity that give rise to a need for cooling or air conditioning for occupant comfort in some other parts of the world. People in the UK normally accept that outdoor air temperatures may exceed 30°C for a few hours per year, and similar conditions would normally be tolerated inside buildings for these sorts of periods. A real, or perceived, need for cooling commonly arises in buildings as a result of additional warming of the indoor air caused by aspects of the building design and activities taking place in the building which increases the frequency of occurrence of such temperatures.

APPENDIX A3. Alternative means of removing heat gains from buildings

It is preferable to minimise the rate of heat gain to the building by design in order to reduce the need for mechanical cooling. However, care is needed to ensure that this does not conflict with the similar need to minimise the requirement for winter space heating. A compromise will often be necessary. Artificial lighting and office equipment also contribute to the heat gains in the building, and their contribution can be minimised by the selection of efficient components and by careful management and control.

The alternative to providing cooling is generally to ventilate excess heat away and replace the air lost with fresh outdoor air.

Ventilation may be achieved naturally, making use of natural air movement through window openings or the stack effect [7][A4], or mechanically by the provision of individual ventilator fans or fan driven ducted air systems. The following additional points should be considered:

- Naturally ventilated buildings generally consume far less energy than air conditioned buildings, although part of this difference can be due to the reduced energy requirements of the activities that take place in them.

- Mechanical ventilation systems consume the energy required by the fans in circulating air to spaces within the building. For health reasons a certain minimum amount of fresh air must always be supplied during occupancy.

- Mechanical ventilation systems generally consume less energy than equivalent air conditioning systems since they do not require the operation of refrigeration plant, or the circulation of cooled water.

- However, attention should be paid to the design of mechanical systems since a poorly designed mechanical ventilation system could consume significantly more energy than some well designed systems which include cooling.

REFERENCES

[A1] Energy Consumption Guide 19, "Energy Efficiency in Offices". Energy Efficiency Office, Best Practice Programme. Oct 1991.

[A2] Energy Efficiency Series 6, "Energy use and energy efficiency in UK commercial and public buildings up to year 2000". Energy Efficiency Office. 1988.

[A3] Good Practice Case Study 1; 13; 14; 15; 16; 17; 19; 20; 21; 105. Energy Efficiency Office, Best Practice Programme, Various dates Dec 1989 - Nov 1991.

[A4] BS 5925:1991, "Code of practice for ventilation principles and designing for natural ventilation".

ADDITIONAL READING

Good Practice Guide 10, "Selecting Efficient Conditioning Systems". Energy Efficiency Office, Best Practice Programme. (To be published, 1993)

APPENDIX 4

BUILDING REGULATIONS PROPOSED REVISION OF PART A

GENERAL REQUIREMENTS OF THE REGULATIONS

BUILDING REGULATIONS PROPOSED REVISION OF PART A

GENERAL REQUIREMENTS OF THE REGULATIONS

OUTLINE OF THE PROPOSALS

1. (a) The changes to the regulations repeated in this Part are intended to maintain a parity as far as is possible with the other UK regulations while fine-tuning the interpretative requirements and consolidating the content. Some amendments to terms and definitions determined by the requirements of Parts D and E of these standards are identified by a marginal reference to these Parts and opportunity to comment on these particular changes is given through the consultation process for Parts D and E.

   (b) In order to assist in identifying the changes and with comparing the existing regulations with those proposed for consultation purposes, the text to be deleted is struck through with a single line and new text is underlined twice.

2. The changes to definitions not covered elsewhere are:

   'Porch': to permit a translucent roof;
   'Place of Special Fire Risk': to clarify appliances burning oil or gas are for heating alone;
   'Boundary' and 'Technical Standards': for editorial reasons; and
   'Decorative Fuel-Effect Gas Appliance': to remove the contradictory last sentence.

3. The reason for the changes to the regulations are as follows:

Regulation 3

Concern has been expressed that Part G of the Technical Standards which enables control of ingress of dangerous substances from a site to a building is compromised by the exemptions by this regulation of extensions to otherwise controlled buildings. The proposed adjustment of this regulation removes exemption from control from certain classes of building and extensions where dangerous site conditions are present.

Schedule 1

Class 4

This change is to ensure a building must be set back from any boundary with land in different ownership including the whole of an adjacent road thus safeguarding all adjoining parties. The limitations are also co-ordinated with those of Class 16 where building descriptions are common.

Class 7

As in Class 4 the change co-ordinates limitations with Class 16.

Class 9

The alteration to the exemption is intended to make identification of buildings whose use is not essential for the operation of the railway or civil engineering work and thus not exempted, clearer.

Class 10

This change is to ensure that safe glazing is incorporated in the building notwithstanding its exemption.

Class 12

Two changes here. One is to disapply this Class from domestic property covered elsewhere in the Schedule and the second is to ensure the building incorporates safe glazing.

Class 18

This change repairs the omission of a store which could be constructed differently from its nearest descriptive equivalent, namely, a hut.

Class 21

This change is to ensure extensions have safe glazing.

Schedule 2

Two new categories of fixtures have been introduced together with a consequential adjustment to category 7. Sanitary appliances are frequently re-located within the rooms in which they are situated for reasons of personal preference; much of this work is done responsibly and it is now recognised that by its nature it is clearly impractical to sustain the current procedures relating to this work. Stairlifts in dwellings are often transient and urgent modifications and are usually installed by specialists, consequently the warrant procedure is seen as impractical. These new categories together with the existing ones should also greatly reduce the potential for the building owner unwittingly to carry out work unlawfully.

Note: Regulation 4 relates solely to fixtures and a warrant would be required for a change of use where for example installation of new sanitary appliances resulted in the creation of a bathroom from a room.

Schedule 2, Footnote

This change modifies the standards to be met by replacement fixtures.

Schedule 5

Rule 1

The area of a room in a dwelling is discounted where the headroom is less than 1.5 metres to represent a realistic basis for area related specifications.

Rules 3, 4 and 5

The changes to these rules reflect the need to make provision for measurements to provide a basis for standards for evolution in design of basements.

PART A

GENERAL

Contents

Introduction

Definitions

References to published standards

The Regulations

3. Exempted classes of buildings
4. Fixtures not requiring a warrant
5. Limited life buildings
6. Classification of buildings by purpose
7. Occupancy capacity
8. Measurements
9. Compliance with building standards

The Schedules

1. Exempted classes of buildings
2. Fixtures not requiring a warrant
3. Classification of buildings by purpose
4. Occupancy load factors
5. Rules of measurement

ASTERISKS

Throughout the Technical Standards an asterisk against a standard denotes that a provision deemed to satisfy the standard or some aspect of the standard is specified at the end of the relevant Part.

ITALICS

Throughout the Technical Standards a term in italics is a defined term. The definition is listed in Part A, General.

Part A
Introduction

1. The intention of this Part is to give information on the general application of the Building Standards (Scotland) Regulations ~~1990.~~ xxxx It contains:

   a. a full list of the defined terms used both in the Statutory Instrument (SI) and in the *Technical Standards*;

   b. instructions on the interpretation of references to other published standards;

   c. a complete extract of Regulations 3-9 of the SI which deal with the way in which the Regulations are applied generally: covering exempted *buildings*; fixtures not requiring a warrant; *limited life buildings*; classification of *buildings* by purpose; *occupancy capacity*; rules of measurement; and means of compliance; and

   d. a set of the Schedules to the SI essential to interpret and apply the Regulations, ie Schedules 1-5.

2. The material in Part A is included to enable the reader to interpret the provisions in the *Technical Standards* without the constant need to cross-refer to the SI itself. For the same reason, all other Parts of the *Technical Standards* are prefaced by verbatim copies of the Regulations in the SI for which they provide the *relevant standards*.

3. It should be noted that applications for warrants for the *construction* or change of use of a *building* made before the date of coming into force of these Regulations and *relevant standards* and applications for extension of the period of validity or amendment of warrant remain subject to the Building Standards Regulation and *relevant standards* in operation at the time the application for warrant was made.

PART A

DEFINITIONS

PART S ~~**ACCESS STAIR** means a stair providing access to -~~

~~a. one or more *dwellings*; or~~

~~b. *shared residential accommodation*; or~~

~~c. facilities within the curtilage of such *dwellings* or accommodation.~~

PART S **ACCOMMODATION STAIR** means a stair which is not an ~~*access stair*,~~ *escape stair* or *private stair*.

the ACT means the Building (Scotland) Act 1959.

AGRICULTURE has the same meaning as in the Agriculture (Scotland) Act 1948(a), and **AGRICULTURAL** shall be construed accordingly.

AIR SUPPORTED STRUCTURE means a structure which has a space-enclosing single-skin membrane anchored to the ground and kept in tension by internal air pressure so that it can support applied loading.

PARTS D/E **ALTERNATIVE EXIT** means an *exit* from a *dwelling* which is through a door other than ~~through~~ its main entrance door and is available for use at all times.

APARTMENT means a *room* in a *dwelling* not used solely as a *kitchen*, store or utility *room*.

BASEMENT STOREY means any *storey* which is below the level of the *ground storey*.

BOUNDARY means a *boundary* between land on which a *building* is situated and land in *different occupation*, so however that -

a. in relation to any external side of a *building* it shall exclude any part of the *boundary* which makes an angle with that side of more than 80 °;

b. in relation to any road, whether public or private, public access way or public right of way, river, stream, canal, loch, pond, common land or public open space it shall be taken to be the centre line thereof; and (itals)

c. the sea and its foreshore shall not be regarded as land in *different occupation*.

BUILDING means any structure or erection of what kind or nature soever, whether temporary or permanent, and every part thereof, including any fixture affixed thereto, not being a structure or erection or part thereof consisting of, or ancillary to -

a. any road, whether public or private, including in the case of a *public road* (but not in the case of a private road) any bridge on which the road is carried;

b. any sewer or water main which is, or is to be, vested in a public authority;

c. any aerodrome runway;

d. any railway line;

e. any large raised reservoir within the meaning of the Reservoirs Act 1975(b); or

f. wires and cables, their supports above ground and other apparatus used for telephonic or telegraphic communication,

and includes any prospective *building*; and in relation to the extension, alteration or change of use of a *building* any reference to the *building* shall be construed as a reference only to so much of the *building* as is comprised in the extension or is the subject of alteration or change of use as the case may be.

CARPORT means a roofed *building* for vehicle storage which is open on at least two sides except for roof supports.

CAVITY in Part D means a concealed space enclosed by elements of a *building* (including a suspended ceiling) or contained within an element, but not a *room*, cupboard, circulation space, stairway enclosure, lift well, *flue* or a space within a chute, *duct*, pipe or conduit.

(a) 1948 c.45

(b) 1975 c.23.

PARTS D/E **CAVITY BARRIER** means any *fire-resisting construction* provided to seal a cavity against the penetration of smoke or flame, or to restrict its movement within the cavity.

CHIMNEY means a structure enclosing one or more *flues*, not being a *flue-pipe*, but including a factory-made insulated chimney, and including any opening for the accommodation of a heat-producing appliance, but does not include a chimney-can.

CHIMNEY-STACK means that part of a *chimney* which rises above a roof of the *building* of which it forms part and includes any cope but not a *chimney*-can.

CLOSED COURT means an external space wholly enclosed by walls with no break more than 2 m wide in any wall.

PARTS D/E **COMPARTMENT**, except in the expression *watercloset compartment*, means ~~any part of a *building* which is divided from all other parts by one or more *compartment walls* or *compartment floors* or by both such walls and floors; and, if any part of the top *storey* of a *building* is within a compartment, that compartment shall also include any *roof space* above such part of the top *storey*~~a part of *building constructed* to prevent the spread of fire to or from another part of the same *building*. A *compartment* may contain one or more *rooms*, spaces or *storeys*. A roof space above the top *storey* of a *compartment* is included in that *compartment*. Compartmented and compartmentation shall be construed accordingly.

PARTS D/E **COMPARTMENT FLOOR** and **COMPARTMENT WALL** mean respectively a floor and wall ~~complying with the provisions of Part D of the *Technical Standards* relating to compartment floors and walls and dividing a *compartment* of a *building* or a lift well in a *building* from the remainder of the *building*~~used in the separation of one *compartment* from another.

CONSERVATORY means a *building* attached to and having an entrance from a *dwelling* and having not less than three-quarters of the area of its roof and not less than one-half of the area of its *external walls* made of translucent material.

CONSTRUCT includes alter, erect, extend and fit, and **CONSTRUCTION** shall be construed accordingly.

COVERED AREA means a roofed *building* which is open on at least two sides except for roof supports.

DEAD LOAD means the load due to the weight of all walls, permanent partitions, floors, roofs and finishes, including services and other permanent *construction*.

DECORATIVE FUEL-EFFECT GAS APPLIANCE means an open *flued* appliance designed to simulate a solid fuel open fire primarily for decorative purposes and intended to be installed so that the products of combustion pass unrestricted from the firebed to the *flue*.~~It does not include an inset live fuel effect gas fire.~~

DIFFERENT OCCUPATION, in relation to two adjoining *buildings* or parts of one *building*, means occupation or intended occupation of those *buildings* or parts by different persons.

DISABLED PEOPLE means persons with a physical, hearing or sight impairment which affects their mobility or their use of *buildings*.

DRAINAGE SYSTEM means the system of pipes and drains used for the drainage of a *building*, including all other fittings, appliances and equipment so used.

DRY FIRE MAIN means a pipe installed in a *building* for fire fighting purposes which is normally dry but is capable of being charged with water by pumping from a fire service appliance.

DUCT means a passage, other than a *flue*, used solely for conveying air, gases, or services including refuse, whether or not these are contained in separate pipes.

DWELLING means a unit of residential accommodation occupied (whether or not as a sole or main residence) -

a. by a single person or by people living together as a family; or

b. by not more than six residents living together as a single household (including a household where care is provided for residents).

~~**ELECTRO-MAGNETIC OR ELECTRO-MECHANICAL DEVICE SUSCEPTIBLE TO SMOKE** means a device which allows a door held open by it to be operated manually at all times and to close automatically upon -~~

PARTS D/E ~~a. the operation of an automatic smoke detector; or~~

~~b. the manual operation of a switch fitted in a suitable position; or~~

~~c. the failure of electricity supply to the device, apparatus or switch; or~~

~~d. if a fire alarm system is installed in the *building*, operation of that system.~~

ELEMENT OF STRUCTURE means - a part of a *building* which is referred to in Table 2 to *relevant standard* D2.1.

PARTS D/E ~~a. a beam or column or other member forming part of a structural frame, not being a member forming part of or supporting only a roof structure, unless the roof performs the function of a floor; or~~

~~b. an internal or *external wall* supporting any other structural element for which a standard of fire resistance is prescribed in the *Technical Standards*; or~~

~~c. a protected area of an *external wall*; or~~

~~d. a *separating wall* or *compartment wall*; or~~

~~e a floor other than the lowest; or~~

~~f. a door, shutter, *duct*, access cover or hatch for which a standard of fire resistance is prescribed in the *Technical Standards*.~~

EMERGENCY LIGHTING means lighting, designed to come into, or remain in, operation automatically in the event of either a local or general power failure.

PARTS D/E **ENCLOSED SHOPPING CENTRE** means a *building* containing shops having frontages to an arcade, mall or other circulation area.

ESCAPE ROUTE means a route by which a person may reach a *place of safety* and in relation to -

- a. a *storey*, including a roof area accessible other than for maintenance only, means a route from an *exit* from that *storey*;
- b. a *room*, means a route from a doorway of that *room*;
- c. a *flat* or *maisonette*, means a route from the main entrance door of that *flat* or *maisonette*;
- d. a *gallery*, catwalk or openwork floor, means a route from any point on that *gallery*, catwalk or openwork floor.~~from any point of a *storey*. It includes *protected zones* and *unprotected zones* and, for *travel distance* and certain specified minimum width requirements only, the route within a *room*.~~

PARTS D/E **ESCAPE STAIR** means a stair or ramp forming part of an *escape route*.

EXIT means a point of egress from a *room* or *storey* which forms part of, or gives access to, an *escape route* or *place of safety*.

PART J **EXPOSED** in Part J in relation to a ~~wall or floor~~ building element means ~~a wall or floor~~ an element directly exposed to the outside air or a ground floor directly in contact with the ground or an underfloor space ventilated in accordance with Part G.

EXTERNAL WALL includes a part of a roof pitched at an angle of 70° or more to the horizontal.

PARTS D/E **FIRE DOOR** means a door or shutter which, together with its frame and furniture as installed in a *building*, is intended, when closed, to resist the passage of fire and/or gaseous products of combustion and is capable of meeting specified performance criteria in Table 3 to *relevant standard* D2.1.

PARTS D/E **FIRE-FIGHTING LOBBY** means a lobby within a *fire-fighting shaft* providing access from the fire-fighting stair to accommodation and to any associated fire-fighting lift.

PARTS D/E **FIRE RESISTANCE** means the ability of an *element of structure* to satisfy the criteria specified in Table 2 to standard D2.1 and **FIRE RESISTANT** and **FIRE RESISTING** shall be construed accordingly. The methods of determining fire resistance are described in the Appendix to Part D.

PARTS D/E **FIRE-FIGHTING SHAFT** means an enclosure protected from fire in adjoining accommodation containing a fire-fighting stair, *fire-fighting lobbies* at every *storey* served and, if provided, a fire-fighting lift together with its machine room.

PARTS D/E **FIRE-STOP** means a seal of ~~fire-resisting~~ *fire-resisting* material provided to close an imperfection of fit between elements, components or *construction* so as to ~~restrict penetration~~prevent the passage of smoke and flame through that imperfection for a reasonable period. **FIRE-STOPPING** and **FIRE-STOPPED** shall be construed accordingly.

FLAT means a *dwelling* on one *storey*, forming part of a *building* from some other part of which it is divided horizontally, and includes a *dwelling* of which the main entrance door and associated hall are on a different *storey* from the remainder of the *dwelling*.

FLAT ROOF means a roof the slope of which does not exceed 10° from the horizontal.

FLIGHT means part of a stair or ramp uninterrupted by a landing.

FLOOR in Part G means any *construction* between the surface of the ground, or the surface of any hardcore laid upon the ground, and the upper surface of the floor, together with any floor finishes which are laid as part of the permanent *construction*.

FLUE means a passage which conveys the products of combustion to the open air.

FLUE-PIPE means a pipe forming a *flue*, but not a pipe fitted as a lining in a *chimney*.

FOUL WATER means any water contaminated by soil water, waste water or trade effluent.

FOUNDATION means that part of the structure in direct contact with, and transmitting loads to, the ground.

GALLERY means a raised floor or platform, ~~whether level or not,~~including a raised storage floor which is open to the *room* or space in which it ~~situated~~projects and which -

PARTS D/E
- a. has every part of its upper surface not less than 1.8 metres above the surface of the main floor of the said *room* or space; and
- b. occupies (or, in the case of there being more than one *gallery*, together occupy) not more than one-half of the floor area of the said *room* or space.

GLAZING means any permanently secured sheet of glass or plastics.

GREENHOUSE, except in the expression *agricultural greenhouse*, means a *building* ancillary to a *dwelling* used mainly for growing plants which is either -
- a. detached from the *dwelling*; or
- b. attached to, but not entered from, the *dwelling*.

GROUND STOREY means the *storey* in the *building* in which there is situated an entrance to the *building* from the level of the adjoining ground or, if there is more than one such *storey*, the lower or lowest of these.

HARMFUL OR DANGEROUS SUBSTANCES includes deposits of faecal or animal matter and any substance or mixture of substances which is or could become corrosive, explosive, flammable, radioactive or toxic or which produces or could produce any gas likely to have any such characteristic.

HOUSE means a *dwelling* on one or more *storeys*, either detached or forming part of a *building* from all other parts of which it is divided only vertically.

IMPOSED LOAD means the load assumed to be produced by the intended occupancy or use, including the weight of moveable partitions, distributed, concentrated, impact, inertia and snow loads, but excluding wind loads.

PARTS D/E **INNER ROOM** means ~~*a room*~~ an *apartment* which does not have direct access to an *exit*, or to an enclosed circulation area having an *exit*.

INSULATED FLUE-PIPE means a *flue-pipe* surrounded by a sealed air space or insulating material protected by an outer casing.

KITCHEN means any *room* or part of a *room* used primarily for the preparation or cooking of food.

LAND IN DIFFERENT OCCUPATION, in relation to a *building*, means land occupied or to be occupied by a person other than the occupier of the land on which the *building* is or is to be situated.

LIMITED LIFE BUILDING means a *building* intended to have a life of the period specified in regulation 5.

LOW LEVEL DISCHARGE APPLIANCE means a heat-producing appliance designed to operate without a *chimney* and to discharge its products of combustion to the outside air at a height less than that required for a *chimney*.

MAISONETTE means a *dwelling* on more than one *storey*, forming part of a *building* from some other part of which it is divided horizontally.

NON-COMBUSTIBLE means that a material is resistant to combustion as determined by an appropriate test procedure as specified in Part D.

OCCUPANCY CAPACITY shall be construed in accordance with regulation 7.

OCCUPIER, in relation to a *dwelling*, means the person inhabiting the *dwelling*.

OPEN COURT means an external space, other than a recess, enclosed by walls on at least 3 sides but with at least one break of more than 2 m in a wall. A recess becomes an open court when -
- a. a *ventilator* is in the back wall of the recess and the ratio of the length of the back wall to the depth of the recess is less than 1 to 1; or
- b. a *ventilator* is in a side wall of the recess and the ratio of the length of the back wall of the recess to the depth into the recess of the centre-line of the *ventilator* is less than 2 to 1.

PASSENGER CONVEYOR means a power-driven installation containing an endless moving walkway for the conveyance of persons between different levels or between different parts of the same level of a *building*.

PERMANENT VENTILATOR means a *ventilator* which provides continuous ventilation.

PLACE OF SAFETY means either -
- a. an unenclosed space in the open air at ground level; or
- b. an enclosed space in the open air at ground level leading to an unenclosed space, via an access not narrower than the total width of the *exits* leading from the *building* to that enclosed space.

PLACE OF SPECIAL FIRE RISK means any place within, or attached to, or on the roof of, a *building* in which there are installed one or more -

a. solid fuel burning heating appliances, with a total installed output rating exceeding 45 kW; or

b. oil or gas burning heating appliances, with total installed input rating exceeding 60 kW, other than forced air convection or radiant heaters in *buildings* of occupancy groups 3 to 7 inclusive; or

c. fixed internal combustion engines, including gas turbine engines, with a total output rating exceeding 45 kW; or

d. oil-immersed electricity transformers or switch gear apparatus with an oil capacity exceeding 250 litres and operating at a supply voltage exceeding 1000 volts.

~~**POINT OF ORIGIN** means -~~

PARTS D/E ~~a. in the case of a *flat or maisonette*, the main entrance door to the *flat or maisonette*; or~~

~~b. in any other case, any point within a *room* or *storey*.~~

PORCH means a *building* attached to and having an entrance from a *dwelling* ~~and having a roof of opaque material~~.

PRIVATE STAIR ~~OR RAMP~~ means a stair or ramp -

PARTS D/E a. wholly within a *dwelling*; or

b. wholly within *shared residential accommodation*.

PROTECTED CIRCUIT means a circuit originating at the main incoming switch or distribution board, the conductors of which are suitably protected against fire.

PROTECTED DOOR means~~-~~ a *self-closing fire door* giving access to a *protected zone*; or a door leading directly to -

~~a. a *self-closing fire door* giving access to a *protected zone*; or~~

~~b~~a. ~~a door leading directly to~~ a *place of safety*; or

~~c~~b. ~~a door giving access to~~ an unenclosed external *escape stair*; or

~~d~~c. ~~a door leading to~~ an *escape route* across a *flat roof*~~.~~; or

d. a *fire-fighting shaft* used also as an *escape route*.

PROTECTED ENCLOSURE means a circulation area wholly within a *dwelling constructed* to resist fire in adjoining accommodation. It includes a hall, landing or *private stair* but not a *room*.

PROTECTED LOBBY ~~means a lobby within a *protected zone* but separated from the remainder of the zone by a *self-closing fire door* and a wall or screen, each having a fire resistance of at least 30 minutes.~~ means a lobby *constructed* to resist fire in adjoining accommodation. The lobby provides additional protection from fire and smoke to a *protected door* or door to a *place of special fire risk*.

PROTECTED ZONE ~~means that part of an *escape route* which is within a *building*, but not within a *room*, and to which access is only by way of a *protected door* and from which exit is directly to a *place of safety*.~~ means within a *building* that part of an *escape route* which is *constructed* to resist fire in adjoining accommodation. Access to a protected zone must be by way of a *protected door*.

PUBLIC OPEN SPACE includes land used as a public park or for public recreation or as a burial ground.

PUBLIC ROAD has the same meaning as in the Roads (Scotland) Act 1984(a).

PURPOSE GROUP and **PURPOSE SUB-GROUP** mean respectively a group or sub-group of *buildings* specified in Schedule 3 to the Building Standards (Scotland) Regulations 1990 as amended.

REASONABLY PRACTICABLE in relation to the carrying out of any operation, means reasonably practicable having regard to all the circumstances including the expense involved in carrying out the operation.

RELEVANT STANDARD means a standard set out in the *Technical Standards* which relates to the requirements of a particular provision of the Building Standards (Scotland) Regulations 1990 as amended.

ROOF in Part G means any roof, including eaves and junctions with other elements penetrating or connected to the roof.

ROOF SPACE means any space in a *building* between a part of the roof and the ceiling below.

ROOM means any enclosed part of a *storey* intended for human occupation or, where no part of any such *storey* is so enclosed, the whole of that *storey*, but excepting in either case any part used solely as a bathroom, shower room, washroom, *watercloset compartment*, stair or circulation area.

ROOM-SEALED APPLIANCE means a heat-producing appliance which, when in operation, has its combustion air inlet and its combustion products outlet isolated from the *room* or space in which it is installed.

PARTS D/E **SANITARY ACCOMMODATION** includes bathrooms, shower-rooms, washrooms and *watercloset compartments*~~, and washrooms~~.

SANITARY FACILITIES includes washbasins, baths, showers, urinals and waterclosets.

SELF-CLOSING FIRE DOOR means a *fire door*, fitted to close automatically from any angle of swing.

PART J **SEMI-EXPOSED** in relation to a building element ~~wall or floor~~ in Part J means an element ~~a wall or floor~~ between a *building* to which Part J applies and a *building* ~~or part of a *building*~~ to which it does not apply.

SEPARATING FLOOR and **SEPARATING WALL** mean respectively a floor or wall *constructed* to prevent the spread of fire between *buildings* or parts of a *building* in accordance with standard D3.1.

~~**SEPARATING FLOOR** or **SEPARATING WALL** mean respectively a floor or wall separating-~~

~~a. any two adjoining *buildings*, or parts of one *building*, in *different occupation*; or~~

~~b. any two adjoining *buildings*, or parts of one *building*, of different *purpose groups*; or~~

~~c. any two adjoining parts of one *building*, where one part is in single occupation and the other in common occupation.~~

SERVICE OPENING means any opening to accommodate a *duct*, pipe, conduit or cable (including fibre optics or similar tubing).

SHARED RESIDENTIAL ACCOMMODATION means a unit of accommodation of *purpose sub-group* 2B having an *occupancy capacity* not exceeding 10, entered from the open air at ground level and having no *storey* at a height exceeding 7.5m.

SITE, in relation to a *building*, means the area of ground covered or to be covered by the *building*, including its *foundations*.

SMOKE ALARM means a device powered by mains electricity, with or without a back-up power source, containing within one housing all the components necessary for detecting fire and thereupon giving an audible alarm.

SOCKET OUTLET means a fixed device containing contacts for the purpose of connecting to a supply of electricity the corresponding contacts of a plug attached to any current-using appliance.

STOREY means that part of a *building* which is situated between the top of any floor and the top of the floor next above it or, if there is no floor above it, between the top of the floor and the ceiling above it or, if there is no ceiling above it, the internal surface of the roof; and for this purpose a *gallery* or catwalk, or an openwork floor or storage racking shall be considered to be part of the *storey* in which it is situated.

SURFACE WATER means the run-off of rainwater from roofs and any paved ground surface within the curtilage of a *building*.

TAPERED TREAD means a stair tread in which the nosing is not parallel to the nosing of the tread or landing next above.

(a) 1984 c.54.

TECHNICAL STANDARDS means the Technical Standards for compliance with the Building Standards (Scotland) Regulations 1990 issued by the Scottish Office in October 1990 as amended by the substitute pages issued by the Scottish Office in and dated July 1993 and .... 1994.

PARTS D/E **TRAVEL DISTANCE** has the meaning assigned to that expression by ~~Standard E2.71~~*relevant standards* E2.6 and E2.7.

TRICKLE VENTILATOR means a closeable small *ventilator* which can provide minimum ventilation.

UNPROTECTED AREA, in relation to an *external wall* or side of a *building*, means -

a. any opening, including a door or window, but not an unopenable window containing only *glazing* which reacts to heat to provide the required standard of fire resistance for an *external wall*; or

b. any part of an *external wall* which has less than the prescribed standard of fire resistance; or

c. any part of an *external wall* which has combustible material more than 1mm thick attached or applied to its external face, whether for cladding or any other purpose.

UNPROTECTED ZONE means that part of an *escape route* which is outwith either a *room* or a *protected zone.*

UPPER STOREY means any *storey* which is above the level of the *ground storey.*

U-VALUE (or thermal transmittance co-efficient) means the rate of heat transfer through 1 m^2 of a structure when the temperature at each side of the structure differs by 1 °C (expressed in W/m^2K).

VENTILATED SPACE in Part J means a space which is enclosed by structure, part of which is exposed to the outside air, and permanently ventilated to the outside air by openings or *ducts* having an aggregate area exceeding 30% of the wall area.

VENTILATOR means a window, rooflight, grille or similar *building* component (and in the case of a *dwelling* includes a door) capable of being opened to provide ventilation.

WALL in Part G means any wall, including piers, *chimneys*, columns and parapets which form part of the wall.

WATERCLOSET COMPARTMENT means an enclosed part of a *storey* which contains a urinal or a watercloset pan and which has provision for flushing from a piped supply of water and is connected to a *drainage system.*

WET FIRE MAIN means a pipe installed in a *building* for fire fighting purposes which is permanently charged with water from a pressurized supply.

WIND LOAD means the load due to the effect of wind pressure or suction.

WORKPLACE means any premises or part of premises which are not domestic premises and are made available to any person as a place of work, and includes -

a. any place within the premises to which such person has access while as work; and

b. any room, lobby, corridor, staircase, road or other place used as a means of access to or egress from the workplace or where facilities are provided for use in connection with the workplace other than a public road.

Part A
References to published standards

1. Any reference in the *Technical Standards* to a British Standard (BS) or a British Standard Code of Practice (CP) shall be construed as a reference to -

   a. a British Standard or a British Standard Code of Practice published by the British Standards Institution; or

   b. a national technical specification of a Member State of the European Community which provides an equivalent standard of protection or performance.

2. Any reference in the *Technical Standards* to a British Board of Agrément (BBA) Certificate shall be construed as a reference to a British Board of Agrément Certificate current as at ~~30 September 1990.~~ xx xxxxxxxxxxxx 19xx

3. Any reference in the *Technical Standards* to a publication shall be construed as a reference to that publication as detailed in column 1 of the list of publications given in the Appendix, subject to such amendments, supplements or addenda as are detailed in column 3 of the Appendix.

4. Where a publication referred to in the *Technical Standards* itself refers to another publication, the reference to such other publication shall be taken to be a reference to the latest edition thereof as at ~~30 September 1990,~~ xx xxxxxxxxx 19xx including any amendments, supplements or addenda thereto current at that date.

5. In addition, attention is particularly drawn to the status accorded to a wide range of European publications in the "Provisions deemed to satisfy the standards" for Part B: Fitness of Materials, of the *Technical Standards*. These important provisions are included to avoid unnecessary restrictions to trade within the European Community and to ensure compliance with the Construction Products Directive (CPD) (89/106/EEC). Compliance with the standards contained in publications in these categories represents compliance with the appropriate standards referred to elsewhere in the *Technical Standards*.

Part A
The Regulations

The following is a complete extract of Regulations 3-9 of the Building Standards (Scotland) Regulations xxxxxxxx ~~1990~~. It is reproduced here for the convenience of readers in considering the application and interpretation of the *relevant standards* as set out in the succeeding Parts of the *Technical Standards.*

Exempted classes of *buildings*

3 Subject to the exceptions in column (3) of Schedule 1, and to the exception of any *building* or extension to a *building*, situated on land contained by its *boundary* which contains harmful or dangerous substances, specifed in Classes 6, 7, 12 and 18 to 21 of column (1) of Schedule 1 these Regulations shall not apply to any *building* the whole of which falls into any one or more of the exempted classes specified in Part I of that Schedule or to any extension to a *building* the whole of which extension falls into any one or more of the exempted classes specified in Part II thereof.

Fixtures not requiring a warrant

4 For the purposes of the proviso to section 6(1) of *the Act*, any operation for the alteration of a *building* which consists solely of the fitting of a fixture of a kind specified in Schedule 2 shall not, subject to the exceptions in column (3) of that Schedule, require a warrant.

Limited life buildings

5 For the purposes of section 3(3)(b) of *the Act* (which enables special provision to be made for *buildings* intended to have a limited life) a period of five years is specified.

Classification of *buildings* by purpose

6 (1) For the purposes of these Regulations, *buildings* or parts thereof shall be classified according to the numbered *purpose group* or *groups* and, where applicable, lettered *purpose sub-group* or *sub-groups* set out in Schedule 3.

(2) In the determination of such classification, any use which is ancillary to another use or which is of a minor nature shall be disregarded and the classification shall be that of the principal use or uses.

(3) Where a *building* is divided into *compartments*, nothing in this regulation shall prevent these *compartments* being independently classified, whether or not the division is required by any provision of these Regulations.

(4) Where a *building* or part of a *building* does not fall into any *purpose group* or *sub-group* these Regulations shall have effect as if the more or most onerous standard applicable to any classification applied.

Occupancy capacity

7 (1) For the purposes of these Regulations, the *occupancy capacity* of a *room* or space shall be -

(a) in the case of a *room* or space described in column (1) of Schedule 4 the number (or in the case of a fractional number the next lowest whole number) obtained by dividing the area of the *room* or space in square metres by the relevant occupancy load factor specified in column (2) of that Schedule; or

(b) in any other case the number of persons the *room* or space is likely to accommodate in use.

(2) The *occupancy capacity* of a *building* or *storey* which is divided into *rooms* or spaces shall be -

(a) in the case of a *storey* of a *building* of *purpose group* 2 which is not open to the public and which contains both day *rooms* and sleeping *rooms*, the sum of the *occupancy capacities* of either the day *rooms* or the sleeping *rooms*, whichever is the greater; or

(b) in any other case the sum of the *occupancy capacities* of the *rooms* or spaces.

(3) Where a *room* or space is likely to be put to more than one use, the greater or greatest relevant *occupancy capacity* shall apply.

(4) In this regulation "space" includes a roof or other area open to the external air to which there is access for a purpose other than the maintenance of the *building*.

Measurements

8 For the purposes of these Regulations, measurements shall be made or calculated in accordance with Schedule 5.

Compliance with *building* standards

9 (1) The requirements of these regulations 10 to 33 shall be satisfied only by compliance with the *relevant standards*.

(2) Without prejudice to any other method of complying with a *relevant standard*, conformity with provisions which are stated in the *Technical Standards* to be deemed to satisfy that standard shall constitute such compliance.

Part A
Schedules

The following extract from the Building Standards (Scotland) Regulations ~~1990~~ xxxxxx sets out Schedules 1-5, for ease of reference when applying and interpreting the *relevant standards*.

SCHEDULE 1

Regulation 3

EXEMPTED CLASSES OF *BUILDINGS*

(1) Class	(2) Description	(3) Exceptions
PART I - DETACHED *BUILDINGS*		
***Buildings* controlled by other legislation**		
1	A *building* the *construction* of which is subject to the Explosives Acts 1875 and 1923(a)	
2	A *building* erected on a *site* which is subject to licensing under the Nuclear Installations Act 1965(b)	A *dwelling*, office or canteen
3	A *building* included in the Schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979(c)	A *building* of *purpose group* 1 or 2
***Buildings* not frequented by people**		
4	A *building* into which people cannot or do not normally go	i. A *building* within 10 metres or the equivalent of its height (whichever is the less) of ~~a *boundary*~~the edge of the land in the same occupation. ii. A wall or fence within the exceptions in Class 13 of this Schedule iii. A tank cable sewer drain or other pipe above or below ground which falls within any of th exceptions in Class 16 of this Schedule
5	Fixed plant or machinery or a *building* housing only fixed plant or machinery, the only normal visits to which are intermittent visits to inspect or maintain the fixed plant or machinery	A *building* within 1 metre of a *boundary*
Agricultural* greenhouses and other *agricultural buildings		
6	An *agricultural* greenhouse or other *building* of mainly translucent material used mainly for commercial growing of plants	A *building* used to any extent for retailing (including storage of goods for retailing) or exhibiting
7	A *building* used for any other form of *agriculture*	a A *building* - i. used to any extent for retailing (including storage of goods for retailing) or exhibiting; ii. exceeding 2000 cubic metres in capacity; or iii. within 10 metres or the equivalent of its height (whichever is the less) of a *boundary* of a *building* of *purpose group* 1 or 2 b A tank cable sewer drain or other pipe above or below ground which falls within any of the exceptions in Class 16 of this Schedule.

(a) 1875 c.17 and 1923 c.17.
(b) 1965 c.57.
(c) 1979 c.46; section 1 was amended by the National Heritage Act 1983 (c.47), Schedule 4, paragraph 25.

(1) Class	(2) Description	(3) Exceptions
Works of civil engineering		
8	A work of civil engineering *construction* including a dock, wharf, harbour, pier, quay, sea defence work, lighthouse, embankment, river work, dam, bridge, tunnel, filter station or bed, inland navigation, reservoir, water works, pipe line, sewage treatment works, gas holder or main, electricity supply line and supports	A septic tank, or private sewage treatment works, which is subject to regulation 24-
Buildings of a specialised nature		
9	A *building* essential for the operation of a railway, including a locomotive or carriage shed, or for the operation of a work of civil engineering contained in Class 8, and erected within the curtilage of such a railway or work	A control centre for a railway, road or dock, A passenger station or terminal, a *building* of *purpose group* 1 or 2 or an office or a canteen
10	A road or rail passenger shelter or a telephone kiosk having *glazing* complying with regulation 27(1)(b) and having a floor area not exceeding 30 square metres	A *building* containing a heat-producing appliance which is subject to regulation 14
11	A caravan or mobile home within the meaning of the Caravan Sites and Control of Development Act 1960(a), or a tent, van or shed within the meaning of section 73 of the Public Health (Scotland) Act 1897(b)	
Small *buildings*		
12	A single-*storey building* having glazing complying with regulation 27(1)(b) and having an area not exceeding 30 square metres other than exempted classes 10, 18, 19 and 20 of this Schedule.	A *building* - i. ancillary to or within the curtilage of a dwelling of *purpose group* 1 ii. within 1 metre of a *boundary*; or iii. containing sleeping accommodation or a heat-producing appliance which is subject to regulation 14
13	A wall or fence	A wall exceeding 1.2 metres or a fence exceeding 2 metres in height

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(a) 1960 c.62.

(b) 1897 c.38; section 73 was amended by the National Health Service (Scotland) Act 1972 (c.58), Schedule 6, paragraph 56.

(1) Class	(2) Description	(3) Exceptions
Construction and development *buildings*		
14	A *building* used only by people engaged in the *construction*, demolition or repair of any *building* or structure during the course of that work	A *building* containing sleeping accommodation
15	A *building* used in connection with the letting or sale of any *building* under *construction* until such time as the letting or sale of all related *buildings* is completed	A *building* containing sleeping accommodation
Tanks, cables, sewers, drains etc		
16	Any tank, cable, sewer, drain or other pipe above or below ground	i. A *drainage system*, septic tank or private sewage treatment works, which is subject to regulation 24 ii. A tank which is subject to regulation 15 or 31 iii. A cable, conductor or apparatus which is subject to regulation 26
Temporary *buildings*		
17	A *building* erected on a *site* for a period not exceeding 28 consecutive days or 60 days in any period of 12 months	
Buildings ancillary to *dwellings*		
18	A single-*storey building* ancillary to and within the curtilage of a *dwelling* of *purpose sub-group* 1B or 1C, comprising a garage, garden hut or store or *building* for keeping animals, birds or other livestock for domestic purposes	A *building* - i. exceeding 30 square metres in area; ii. within 1 metre of the *dwelling*, unless it is at least 500 millimetres from any *boundary*; or iii. containing a heat-producing appliance which is subject to regulation 14
19	Any other single-*storey building* ancillary to and within the curtilage of a *dwelling* of *purpose sub-group* 1B or 1C, including a *carport*, *covered area*, *greenhouse*, summer house or swimming pool cover	A *building* - i. exceeding 30 square metres in area; or ii. containing a heat-producing appliance which is subject to regulation 14.
20	An underground or substantially underground *building* within the curtilage of a *dwelling* of *purpose sub-group* 1B or 1C, the purpose of which is solely to afford shelter or protection from the effects of weapons of war (whether nuclear, chemical or conventional)	A *building* - i. exceeding 30 square metres in area; or ii. the excavation for which is nearer to any exposed part of another *building* than a distance equal to the depth of the excavation plus 1 metre.

(1) Class	(2) Description	(3) Exceptions
PART II - *BUILDINGS* ATTACHED TO *DWELLINGS* OF *PURPOSE SUB-GROUP* 1B OR 1C		
21	A single-*storey* extension to an existing *dwelling* of *purpose sub-group* 1B or 1C which is ancillary to the *dwelling* and consists of a *conservatory*, having *glazing* complying with regulation 27(1)(b) *porch*, *greenhouse*, *carport* or *covered area*	A *building* - i. exceeding 30 square metres in area or, in the case of a *porch*, 8 square metres; ii. containing a *flue* or a heat-producing appliance which is subject to regulation 14; or iii. (except in the case of a *greenhouse*, *carport* or *covered area*) within one metre of a *boundary*

NOTES

1. In the application of Part I of this Schedule no account shall be taken of an office use which is ancillary to the main purpose of the *building*.
2. For the purposes of Class 17, an air-supported or otherwise collapsible *building* shall not be exempt solely on account of deflation or other form of intermittent collapse.

SCHEDULE 2

Regulation 4

FIXTURES NOT REQUIRING A WARRANT

(1) Category	(2) Description	(3) Exceptions
1	A fixture or notice for which there is no requirement provided in these Regulations	
2	An outdoor sign which is subject to the Town and Country Planning (Control of Advertisements) (Scotland) Regulations 1984(a)	
3	A heat-producing appliance which is subject to regulation 14	An associated *chimney*, *flue-pipe* or hearth, except a balanced *flue* as referred to in Category 4 below
4	A balanced *flue* serving a *room-sealed appliance*	A *flue* which passes through a combustible wall
5	Lining of a *flue*	
6	Provision of thermal insulating material to or within a wall, ceiling, roof or floor	Application of thermal insulating material to the outer surface of an *external wall*
7	Replacement of a fixture or appliance, in whole or in part, by another of the same general type as that which it is replacing, including a sanitary appliance or sink (together with any relevant branch soil or waste pipe), rainwater gutter or downpipe, heat-producing appliance, electrical fixture, ventilation fan, *chimney* or *flue* outlet fitting or terminal, fire hydrant or main, lift, escalator, solid waste chute or container, door, window, ~~internal or external wall, ceiling or roof~~ lining, cladding, covering or rendering of an internal or *external wall*, ceiling or roof	
8	Replacement of a window by another which is not of the same general type as that which it is replacing	
9.	Provision of a sanitary appliance or sink (together with any relevant branch soil or waste pipe)	
10.	Provision of a stair lift within a *dwelling*	

(a) S.I. 1984/467.

NOTE

Notwithstanding the fact that the fixtures listed in categories 1 to 6, 8 and 10 in this Schedule do not require a warrant they shall in all respects and in the manner of their fitting meet any relevant requirements of these Regulations Fixtures in categories 7 and 9 shall meet any relevant requirements of these Regulations as if a warrant was required.

SCHEDULE 3

CLASSIFICATION OF *BUILDINGS* BY PURPOSE

(1) *Purpose group* and descriptive title	(2) *Purpose sub-group*, where applicable	(3) Description of purpose or form of *building*
1. *Dwellings**	1A	*Flats* and *maisonettes*
	1B	*Houses* containing a habitable *storey* at a height exceeding 4.5 metres
	1C	*Houses* not containing a habitable *storey* at a height exceeding 4.5 metres
2. Institutional and other residential	2A	Residential accommodation, other than *dwellings*, for old people or children or for the treatment, care or maintenance of persons suffering from illness or mental or physical disability or handicap
	2B	Any other *building*, other than a *dwelling*, containing sleeping accommodation
3. Offices		Offices or premises used for office, administrative or clerical purposes (including writing, book-keeping, sorting papers, filing, typing, duplicating, machine calculating, police and fire service work, drawing and the editorial preparation of work for publication), financial transactions (including banking and building society work) and communications (including postal, telegraph and radio, television, film, audio or video recording or performance (not open to the public), communication or control)
4. Shops and Commercial		Shops or premises used for retail or wholesale trade or business, including sales by auction, self-selection and over-the-counter wholesale trading, hairdressing and beauty or body care and premises to which members of the public are invited to resort for the purpose of delivering or uplifting goods in connection with their cleaning, repair, hire or other treatment or (except in the case of the repair of motor vehicles) of themselves carrying out such cleaning, repair or other treatment
5. Assembly and recreational	5A	Places of entertainment and recreation other than sports stadia, including bingo halls, broadcasting, recording and film studios open to the public, casinos, dance halls, entertainment, conference, exhibition and leisure centres (except where consisting predominantly of a swimming pool), funfairs and amusement arcades, licensed betting offices, museums and art galleries, non-residential clubs, public houses, restaurants, cafes, snack bars, theatres, cinemas and concert halls
	5B	Any other places of assembly, including swimming pool *buildings*, churches and other places of worship, crematoria, dancing schools; educational establishments, gymnasia, law courts, libraries open to the public, non-residential day centres, clinics, health centres and surgeries, passenger stations and termini for air, rail, road or sea travel, public toilets, riding schools, ice rinks, sports pavilions, sports stadia, zoos and menageries

* Includes any surgeries, consulting rooms, offices or other accommodation not exceeding in the aggregate 50 square metres forming part of a *dwelling* and used by an occupant of the *dwelling* in a professional or business capacity.

(1) *Purpose group* and descriptive title	(2) *Purpose sub-group*, where applicable	(3) Description of purpose or form of *building*
6. Industrial	6A	Manufacturing, processing, repairing, cleaning, washing, breaking up or otherwise treating any substance comprising or used in association with - adhesives asphalt and bituminous products chemical and allied industries cleaners and solvents clothing and footwear (excluding laundering) coal and petroleum products cork products dry cleaning dye-stuffs and pigments fertilisers grains and cereals inks insulated wires and cables leather, sheepskin and fur linoleum magnetic tape oils and greases paints paper, printing and publishing (excluding paper manufacturing) pharmaceutical products photographic materials and products plastics polishes rubber and synthetic rubber soaps and detergents spirit distilling surgical bandages and plasters synthetic resins textiles timber, joinery, furniture, brushes and brooms toilet preparations upholstery weedkillers and pesticides
	6B	Any other industrial *building* including *buildings* used for generating or supplying power or slaughtering livestock
7. Storage and warehousing**	7A	Storage of hazardous goods or materials, and storage of vehicles containing hazardous goods or materials, including - i. any compressed, liquefied or dissolved gas; ii. any substance which becomes dangerous by interaction with either water or air; iii. any liquid substance with a flash point below 65 ° Celsius including whisky or other spirituous liquor; iv. any corrosive substance; v. any substance capable of emitting poisonous fumes; vi. any oxidising agent; vii. any substance liable to spontaneous combustion; viii. any substance that changes or decomposes readily giving out heat when doing so; ix. any combustible solid substance with a flash point less than 120 ° Celsius; x. any substance likely to spread fire by flowing from one part of a *building* to another
	7B	Storage of any other goods or materials, and car parks and parking garages not coming within *purpose sub-group* 7A or 7C
	7C	Open-sided*** car parks and parking garages, designed to admit or accommodate only passenger or light goods vehicles not exceeding 2500 kilograms gross mass

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**Warehousing excludes self-selection wholesale trading included in *purpose group* 4
***For the purpose of this description "open-sided" means naturally ventilated to provide an adequate supply of air in accordance with regulation 23.

SCHEDULE 4

OCCUPANCY LOAD FACTORS TO BE APPLIED TO *ROOMS* AND SPACES WITHOUT FIXED SEATING, OTHER THAN IN *BUILDINGS* OF *PURPOSE GROUP* 1

(1) Description of *room* or space	(2) Occupancy load factor
Standing spectators' area	0.3
Amusement arcade, assembly hall (including a general-purpose place of assembly), bar (public area), bingo hall	0.5
Concourse, dance hall or floor, queuing area	0.7
Committee *room*, common *room*, conference *room*, dining *room*, licensed betting office (public area), lounge (other than a lounge bar), meeting *room*, reading *room*, restaurant, staff *room*, waiting *room*	1.0
Exhibition hall	1.5
Shop sales area (Class 1)	2.0
Art gallery, dormitory, factory production area, museum, office (*room* not exceeding 60 square metres in area), workshop	5.0
Kitchen, library, office (*room* exceeding 60 square metres in area), shop sales area (Class 2)	7.0
Bedroom or study bedroom	8.0
Bed-sitting *room*, billiards *room*	10.0
Car park, storage and warehouse accommodation	30.0

NOTES

1 For the purpose of this Schedule shops are classified thus -

Class 1 - shops other than those listed below as Class 2, including supermarkets and department stores (all sales areas), shops for personal services such as hairdressing and shops for the delivery or uplift of goods for cleaning, repair or other treatment or for members of the public themselves carrying out such cleaning, repair or other treatment.

Class 2 - shops trading predominantly in furniture, floor coverings, cycles, perambulators, large domestic appliances or other bulky goods, or trading on a wholesale self-selection basis.

2 The descriptions arcade, hall, *gallery* and *room* used in this Schedule do not indicate a particular design or configuration of *building*.

SCHEDULE 5 Regulation 8

RULES OF MEASUREMENT

Area

1 The area of -

(a) a single-*storey building* for the purpose of regulation 3 shall be taken to be the total area, excluding any *gallery* or openwork floor;

(b) a *storey* shall be taken to be the total area of the floors within that *storey* or, if the *building* is *compartmented*, within a *storey* of a *compartment*, excluding any *gallery* or openwork floor;

(c) a *room* excludes any built-in fixture extending from the floor to the ceiling and in the case of a *dwelling* any part of the *room* where the height is less than 1.5 metres..

Cubic capacity

2 The cubic capacity of a *building* or *compartment* shall be taken to be the volume of the space contained by its enclosing walls, the upper surface of the floor of the lowest *storey* in the *building* or *compartment*, and the topmost ceiling in the *building* or *compartment* or, if the topmost *storey* has no ceiling, the internal surface of the roof.

Height and depth

3 The height of -

(a) a *building* shall be taken to be the height from the surface of the ground to the underside of the ceiling of the topmost *storey* or, if the topmost *storey* has no ceiling, one-half of the height of the roof above its lowest part;

(b) a *compartment* shall be taken to be the height within the *compartment* from the upper surface of the floor of the lowest *storey* to the topmost ceiling or, if the topmost *storey* has no ceiling, the internal surface of the roof;

4. ~~(c)~~ The height of a *storey* above the ground or depth of a *storey* below the ground shall be taken to be the vertical height or depth as the case may be from the ground to the upper surface of the floor of the *storey*, and the expression "a *storey* at a height" and "a storey at a depth" shall be construed accordingly.

~~4~~5 In the measurement of height or depth from ground which is not level the height or depth shall be taken to be the mean height or depth, except that -

(a) for the purpose of Class 13 of Schedule 1; and

(b) for any other purpose where the difference in level is more than 2.5 metres,

the height or depth shall be taken to be the greatest height or depth.

General

~~5~~6 Except where the context otherwise requires, measurements shall be horizontal or vertical.

~~6~~7 Measurements of area and cubic capacity shall be taken to the inner surfaces of enclosing walls or, on any side where there is no enclosing wall, to the outermost edge of the floor on that side.

~~7~~8 Any expression of gradient, slope or fall shall be taken to mean one unit of vertical measurement in a given number of such units of horizontal measurement.

~~8~~9 Except for the purpose of regulation 3, any measurements of parts of a *building* in *different occupation* shall be taken separately.

APPENDIX 5

LIST OF CONSULTEES

Consultees

Advocates Library
Age Concern
Aggregate Concrete Block Association
Agniconsult
Angus District Council
Annandale & Eskdale District Council
Architects and Surveyors Institute
Architectural Heritage Society of Scotland
Architectural Metalwork Association
Argyll & Bute District Council
Association for the Conservation of Energy
Association of British Insurers
Association of British Manufacturers of Mineral Insulating Fibres
Association of British Roofing Felt Manufacturers
Association of British Solid Fuel Appliances Manufacturers
Association of Builders Hardware Manufacturers
Association of Building Component Manufacturers Limited
Association of Chief Architects of Scottish Local Authorities
Association of Consulting Engineers
Association of Lightweight Aggregate Manufacturers
Association of Manufacturers of Domestic Electrical Appliances
Association of Municipal Engineers
Association of Scottish Chambers of Commerce
Association of Specialist Fire Protection Contractors and Manufacturers
Autoclaved Aerated Concrete Products Association Limited
Badenoch & Strathspey District Council
Banff & Buchan District Council
Bearsden and Milngavie District Council
Bell College of Technology
Berwickshire District Council
Bituminous Roofing Council
Boiler and Radiator Manufacturers Association
Borders Regional Council
Brick Development Association
British Aggregate Construction Materials Industries
British Automatic Sprinkler Association Limited
British Board of Agreement
British Board of Agreement (Scotland)
British Cement Association
British Coal
British Coal (Scotland)
British Constructional Steelwork Association Limited
British Fire Protection Systems Association Limited
British Flat Roofing Council
British Floor Covering Manufacturers Association
British Gas Corporation
British Institute of Architectural Technicians
British Medical Association
British Non-Ferrous Metals Federation
British Paper and Board Industry Federation
British Plastics Federation
British Precast Concrete Federation Limited
British Property Federation
British Public Works Association
British Retail Consortium
British Rigid Urethane Foam, Manufacturers Association Limited
British Standards Institution
British Steel
British Steel (Scotland)
British Telecommunications PLC
British Wood Preserving and Damp Proof Association
British Wood Preserving Association

British Woodworking Federation
Building Control
Building Services Research and Information Association
Building Societies Association
Caithness District Council
Caledonian Associated Cinemas PLC
Calor Gas Limited Scottish Region
Cape Durastel Ltd
Cement and Concrete Association
Central Region Fire Brigade
Central Regional Council
Chartered Institute of Building
Chartered Institute of Building Scottish Branch
Chartered Institute of Building Service Engineers
Chief and Assistant Chief Fire Officers Association (Scotland)
Cinematograph Exhibitors Association of Great Britain
Cinematograph Exhibitors Association of Great Britain and Ireland
City of Aberdeen District Council
City of Dundee District Council
City Of Edinburgh District Council
City of Glasgow District Council
Clackmannan District Council
Clay Pipe Development Association Limited
Clay Products Technical Bureau of Great Britain Limited
Clydebank District Council
Clydesdale District Council
Commissioner for Local Administration in Scotland
Commissioner for Local Authority Accounts
Common Services Agency for the Scottish Health Service
Companies House
Concrete Block Association
Concrete Society
Confederation of British Industry
Confederation of British Industry (Scottish Office)
Consumers' Association
Controller of Audit Accounts Commission
Convention of Scottish Local Authorities
Cumbernauld & Kilsyth District Council
Cumbernauld Development Corporation
Cumnock & Doon Valley District Council
Cunninghame District Council
Dementia Services Development Centre
Disability Scotland
Domestic Solid Fuel Appliances Approval Scheme
Door and Shutter Manufacturers Association
Dry Lining and Partition Association Limited
Dumbarton District Council
Dumfries & Galloway Regional Council
Dumfries and Galloway Fire Brigade
Duncan of Jordanstone College of Art
Dunfermline Building Society
Dunfermline District Council
East Kilbride Development Corporation
East Kilbride District Council
East Lothian District Council
Eastwood District Council
Edinburgh Architectural Association
Edinburgh College of Art
Edinburgh University
Edinburgh University Unit of Fire Safety Engineering
Electrical Contractors Association
Electricity Consultative Council for the South of Scotland
Electricity Consultative Councils for Scotland
Electricity Council
Environmental Health Advisory Services

Environmental Health Briefing
Ettrick & Lauderdale District Council
Eurisol
Eurisol UK Limited
External Wall Insulation Association
Falkirk District Council
Federation of Civil Engineering Contractors
Federation of Master Builders
Federation of Piling Specialists
Felt Roofing Contractors Advisory Board
Fibre Building Board Organisation
Fibre Cement Manufacturers Association
Fife Fire and Rescue Service
Fife Regional Council
Fire Brigades Union
Fire Protection Association
Fire Resistant Glass And Glazed Systems Association
Fire Service Training College
Flat Glass Association
French Trade Commission for Scotland
Friends of the Earth
Glasgow and West of Scotland Association of the Institution of Civil Engineers
Glasgow Caledonian University
Glasgow College of Building and Printing
Glasgow Institute of Architects
Glass and Glazing Federation
Glenrothes Development Corporation
Gordon District Council
Grampian Fire Brigade
Grampian Regional Council
Granite Supply Association
Gypsum Products Development Association
Hamilton District Council
Harley Haddow Partners
Heating and Ventilation Contractors Association
Heriot-Watt University
Highland and Islands Fire Brigade
Highland Regional Council
Highlands & Islands Enterprise
Home Timber Merchants' Association of Scotland
House of Commons
House of Commons Library
House of Lords
Housing Department
Incorporated Association of Architects and Surveyors
Institute of Building Control
Institute of Building Control (Scotland)
Institute of Clerks of Works of Great Britain Incorporated
Institute of Energy
Institute of Fire Safety
Institute of Housing
Institute of Housing Scottish Branch
Institute of Plumbing
Institute of Solid Wastes, Management
Institution of Civil Engineers
Institution of Civil Engineers Scottish Branch
Institution of Electrical Engineers
Institution of Electrical Engineers (Scottish Centre)
Institution of Fire Engineers
Institution of Mechanical Engineers
Institution of Plant Engineers
Institution of Public Health Engineers
Institution of Structural Engineers
Institution of Water Engineers and Scientists

Insulation Glazing Association
International Fire Consultants
Intumescent Fire Seals Association
Inverclyde District Council
Inverness District Council
Irvine Development Corporation
Joint Standing Committee
JRS Consultancy
Kenchington Ford
Kilmarnock & Loudoun District Council
Kincardine & Deeside District Council
Kirkcaldy District Council
Kyle & Carrick District Council
Lafarge Plasterboard Ltd
Law Society of Scotland
Lead Development Association
Lionweld Kennedy Ltd
Liquefied Petroleum Gas, Industry Technical Association (UK)
Livingston Development Corporation
Lochaber District Council
Lothian and Borders Fire Brigade
Lothian Regional Council
Mark Haywood Associates
Mastic Asphalt Council and Employers Federation
Metal Roof Deck Association
Metal Window Federation of Great Britain
Midlothian District Council
Modusse
Monklands District Council
Moray District Council
Motherwell District Council
Nairn District Council
Napier University
National Association of Fire Officers
National Association of Lift Makers
National Association of Shopfitters
National Building and Allied Hardware Manufacturers Federation
National Cavity Insulation Association
National Council of Building Material Producers
National Farmers Union of Scotland
National Federation of Roofing Contractors
National Federation of Self Employed and Small Businesses
National Fireplace Manufacturers' Association
National House Building Council (London)
National House-Building Council
National House-Building Council Scotland
National Inspection Council for Electrical Installation Contracting (London)
National Inspection Council for Electrical Installation Contracting (Scottish Committee)
National Society for Clean Air
National Trust for Scotland
Nature Conservancy Council
Nithsdale District Council
North East Fife District Council
Oil Appliance Manufacturers Association
Orkney Islands Council
Paintmakers Association of Great Britain Limited
Paisley University
Perth & Kinross District Council
Peter J Steer Consulting Structural Engineer
Phenolic Foam Manufacturers Association
Pilkington Brothers Limited
Planning Exchange
Ploybrook Ltd
Polyethylene Foam Insulation Association
Price Waterhouse
Property Services Agency

Renfrew District Council
RMJM Scotland Ltd
Ross & Cromarty District Council
Roxburgh District Council
Royal Environmental, Health Institute of Scotland
Royal Incorporation of Architects in Scotland
Royal Incorporation of Architects in Scotland, Aberdeen Chapter
Royal Incorporation of Architects in Scotland, Dundee Chapter
Royal Incorporation of Architects in Scotland, Glasgow Chapter
Royal Incorporation of Architects in Scotland, Inverness Chapter
Royal Incorporation of Architects in Scotland, Stirling Chapter
Royal Institute of British Architects
Royal Institution of Chartered Surveyors (Scottish Branch)
Royal Society for the Prevention of Accidents
Royal Society for the Prevention of Accidents (Scottish Branch)
Royal Society of Health
Royal Town Planning Intitute, Scottish Branch
Safe Plumbing Systems,Advisory Group
Sand And Gravel Association Limited Scottish Area
Science Museum Library
Scotch Whisky Association
Scottish Accident Prevention Council
Scottish Aggregate Block Association
Scottish Aggregate Block,Association
Scottish and Northern Ireland,Plumbing Employers Federation
Scottish Association of Directors,of Water & Sewage Services
Scottish Association of Registered House Builders
Scottish Associations of Chief Building Control Officers
Scottish Building Employers Federation
Scottish Churches Committee
Scottish Consortium of Timber Frame Industries (SCOTFI)
Scottish Construction Industry Group
Scottish Consumers Council
Scottish Convention of Women
Scottish Council for Community & Voluntary Organisations
Scottish Council for Single Homeless
Scottish Council on Disability
Scottish Employers Council for the Clay Industry
Scottish Federation of Housing Associations
Scottish Fire Training School
Scottish Gas
Scottish Glass Merchants and Glaziers Association
Scottish Homes
Scottish Hydro-Electric Plc
Scottish Nuclear Ltd
Scottish Power
Scottish Prison Service SPS-3C
Scottish River Purification Boards Association
Scottish Society of Directors of Planning
Scottish Timber Trade Association
Scottish Tourist Board
Scottish Trades Union Congress
Shelter:Scottish Campaign for the Homeless
Shetland Islands Council
Skye & Lochalsh District Council
Society for the Protection of Ancient Buildings
Society of British Gas Industries
Society of Chief Quantity Surveyors in Local Government
Solar Trade Association
Solid Fuel Advisory Service
Solid Fuel Advisory Service Scotland
Spiral Staircase Manufacturers Association
Spray Contracts Technical Committee
Steel Construction Institute

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          Stewartry District Council
          Stirling District Council
          Strathclyde Fire Brigade
          Strathclyde Regional Council
          Strathclyde University
          Strathkelvin District Council
          Suspended Ceiling Association
          Sutherland District Council
          Swedish Finnish Timber Council
          Tarmac Topblock
          Tayside Fire Brigade
          Tayside Regional Council
          The House Builders Federation
          Thermal Insulation Contractors Association
          Thermal Insulation Manufacturers & Suppliers Association
          Thorburn Consulting Engineers
          Timber and Brick Homes Consortium
          Timber Research & Development Association
          Timber Research & Development Association:Scottish Reg Office
          Top Rank Ltd
          Transport Development Group Plc
          Tweeddale District Council
          UK and Ireland Particleboard Association
          Union of Construction Allied Trades and Technicians
          United Kingdom Atomic Energy Authority
          University of Aberdeen
          University of Glasgow
          Warrington Fire Research
          Waterheater Manufacturers Association
          Wellgrove Timber Systems Limited
          West Lothian District Council
          Western Isles Islands Council
          Westminster Advisers Limited
          Wigtown District Council
          Window Advice Centre
          Womens National Commission
          Wood Wool Slab Manufacturers Association
          Zinc Development Association
---------------------------------------------------------------------------
count     359
===========================================================================
```